UGANDA PROTECTORATE.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

IMPERIAL AGRICULTURAL INSTITUTE FOR THE
5 OCT 1931

YEAR ENDED 31ST DECEMBER, 1930.

(PART 1).

PRICE: SHS. 3.

Published by Command of His Excellency the Governor

ENTEBBE:

PRINTED BY THE GOVERNMENT PRINTER, UGANDA.

1931.

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DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT, 1930.

(PART I).

Addresses of Officers and Telephone Numbers:

		P.O. Box No.	*Telephone No.*
Director of Agriculture	Entebbe ...	2 ...	90
Head Office	Entebbe ...	2 ...	91
Agricultural Laboratory and Kampala Plantation	Kampala ...	5 ..	18
Botanic Gardens	Entebbe ...	60 ...	38
Jinja Office	Jinja ...	67 ...	22

Principal Experimental Stations.

(1) Kampala. (2) Serere, Teso. (3) Bukalasa, Mengo, and the Botanic Gardens, Entebbe.

Subsidiary Stations.

(1) Ngetta, Lango.
(2) Fort Portal, Toro
(3) Buwunga, Masaka.
(4) Kakumiro, Mubende.
(5) Bugusege, Bugishu.

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STAFF LIST.

Director of Agriculture	J. D. Tothill, D.Sc. (Harvard), B.Sc. (Toronto).
Deputy Director of Agriculture	L. Hewett, M.R.A.C.
Statistician	H. G. Smith.
Office Superintendent	G. A. Read.
Clerk	A. J. Dowse.

GENERAL DIVISION.

Senior Agricultural Officers	A. R. Morgan, O.B.E. (to 24th September). G. F. Clay, M.C., B.Sc. (Edin.), N.D.A., N.D.D. (Hons.). A. B. Killick, B.Sc. (Lond.), Dip. Agric. (Wye) (from 24th September).
Superintendent of Agricultural Education ...	E. G. Staples, M.A., M.R.A.C., Dip. Agric. (Cantab.).
Agricultural Officers	J. D. Snowden (to 25th September). R. T. Wickham. C. E. J. Biggs, B.Sc. (Lond.), Dip. Agric. (Wye). D. Stedman-Davies, B.Sc. (Wales). A. B. Killick, B.Sc. (Lond.), Dip. Agric. (Wye) (to 23rd September). N. S. Haig, B.Sc. (Lond.), Dip. Agric. (Wye). E. F. Martin, Dip. Agric. (Harper Adams and Northants). O. E. Whitehead (28th May to 8th October). H. L. G. Milne, N.D.A. (from 2nd October). A. J. Kerr, B.A. (Cantab.) (from 9th October). R. P. Davidson, B.Sc. (Edin.), N.D.A. (from 9th October).
Agricultural Officers (Education)	C. W. L. Fishlock, B.Sc. (Lond.), B.Sc. (Reading), A.I.C.T.A. R. W. Stuckey, M.A. (Cantab.), B.S.A. (McGill), A.I.C.T.A. M. G. De Courcy-Ireland, B.A. (Cantab.) (from 20th January).
Coffee Officer	W. L. Munn.
Tobacco Officer	G. T. Philpott (from 30th January).
Cotton Grader and Ginning Inspector ...	Major N. G. Wright.

Plantation Managers :—

G. T. Philpott (to 29th January).	P. Chandler.
Capt. J. S. Harmsworth, M.C.	E. A. Ruck.
C. Hazel.	A. L. Stephens.

Ploughing Instructors :—

J. K. Shepherd (from 20th May).	W. Gray (from 18th September).

AGRICULTURAL LABORATORIES.

Entomologist	H. Hargreaves, A.R.C.S., D.I.C., F.E.S.
Assistant Entomologist	G. L. R. Hancock, M.A. (Cantab.), F.E.S.
Mycologist	C. G. Hansford, M.A. (Cantab.).
Botanist	L. C. C. Liebenberg, B.Sc. (Trans.), M.Sc. (McGill) (to 25th September).
Economic Botanist	J. D. Snowden (from 26th September).
Cotton Botanist	G. W. Nye, B.Sc. (Lond.), Dip. Agric. (Wye).
Assistant Cotton Botanist	H. R. Hosking, B.Sc. (Lond.), A.R.C.S.
Agricultural Chemist	W. S. Martin, Ph.D., M.Sc. (Lond.), A.R.C.S., D.I.C., A.I.C.
Assistant Agricultural Chemist	G. Griffith, Ph.D., B.Sc., A.I.C.T.A. (from 2nd October).

CLERICAL STAFF.

Clerks :—

J. C. S. De Souza.	M. A. S. Menezes.
A. S. Remedios.	F. C. De Sousa.

NATIVE CIVIL SERVICE.

Overseer	Kosea Mukasa.
Clerk	Reuben Sempagala.
Laboratory Assistant	Yoanna Kaidzi.

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT

For the Year ended 31st December, 1930.

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1. With the extension of experimental work in the Department, the complete results from many of which are not available until May or June, it has been considered advisable to publish the report of the Department in two parts:—

Part I.—Administrative.

Part II.—Reports on Scientific Work and Results of Experiments.

It is felt that in this way the general report, which is of immediate interest to the general public, can be published earlier, and the publication of the second part can be deferred until complete results of all experimental work carried out during 1930 are available.

Staff.

2. The following appointments and movements took place during the year:—

Mr. A. R. Morgan, o.b.e., Senior Agricultural Officer, retired on pension on September 24th.

Mr. G. F. Clay, m.c., Senior Agricultural Officer, returned from leave on September 7th.

Mr. A. B. Killick, Agricultural Officer, went on leave on June 7th, and was on leave at the end of the year. He was promoted to the post of Senior Agricultural Officer with effect from September 24th.

Mr. N. S. Haig, Agricultural Officer, returned from leave on April 12th.

Messrs. D. Stedman-Davies and E. F. Martin, Agricultural Officers, went on leave on May 18th.

Mr. C. E. J. Biggs, Agricultural Officer, acted as Senior Agricultural Officer during the whole of the year.

Mr. H. L. G. Milne, Agricultural Officer, arrived on October 21st on first appointment.

Messrs. A. J. Kerr and R. P. Davidson, Agricultural Officers, arrived on November 3rd on first appointment.

Mr. M. G. de Courcy-Ireland, Agricultural Officer, went on leave on September 27th.

Mr. O. E. Whitehead, Agricultural Officer, arrived on June 16th on first appointment and died from blackwater fever on October 8th.

Dr. W. S. Martin, Agricultural Chemist, returned from leave on November 3rd.

Mr. L. C. C. Liebenberg, Botanist, relinquished his appointment on September 26th.

Mr. J. D. Snowden, Agricultural Officer, was appointed Economic Botanist on September 26th.

Mr. G. L. R. Hancock, Assistant Entomologist, returned from leave on October 11th.

Dr. G. Griffith, Assistant Agricultural Chemist, arrived on October 21st on first appointment.

Mr. G. T. Philpott, Tobacco Officer, returned from leave on February 26th.

Mr. A. L. Stephens, Plantation Manager, returned from leave on January 17th.

Mr. P. Chandler, Plantation Manager, went on leave on June 17th.

Mr. E. A. Ruck, Plantation Manager, returned from leave on August 29th.

Mr. C. Hazel, Plantation Manager, went on leave on September 6th.

Mr. J. K. Shepherd, Ploughing Instructor, was locally appointed on August 29th.

Mr. W. Gray, Ploughing Instructor, arrived on October 8th on first appointment.

Mr. G. H. Thomas, Ploughing Instructor, resigned on June 10th.

3. Mr. A. R. Morgan, o.b.e., Senior Agricultural Officer, went on leave in March prior to retirement. Mr. Morgan entered the Protectorate service on March 20th, 1908, as a Cotton Inspector when the total Agricultural and Forestry staff consisted of six officers.

In the cotton season 1908-1909 the export of cotton lint amounted to 3,944 bales and in the year prior to his retirement Mr. Morgan had the satisfaction of seeing the Uganda crop exceed 200,000 bales.

Subsequent to the departure of the late Director of Agriculture, Mr. Morgan acted as Director of Agriculture in the interim period prior to my arrival, and I wish to record the valuable assistance which Mr. Morgan at all times gave me on my taking over control of the Department.

Mr. Morgan's long and valuable services were publicly recognised by the award of the O.B.E.

4. It is with regret that I have to record the death of Mr. O. E. Whitehead, Agricultural Officer, which occurred on October 8th at Lira from blackwater fever. Mr. Whitehead joined the Department on June 16th after considerable previous experience in the West Indies, and East and West Africa, and had shown promise of being a very valuable member of the Field Division of the Department.

5. I desire to record my appreciation of the services rendered by all members of the staff during the year.

General.

6. The rainfall during the year was generally above normal and its distribution more or less regular throughout the Protectorate, although a marked feature of the year was the absence of any continued dry period in the first two months of the year, as is the case in most years. Rainfall below normal was recorded by some stations. The lowest rainfall for the year in the Protectorate, 35·45 inches, was recorded at Mwirasandu, and the highest 86·18 inches was, as usual, recorded at Kalangala, Sese Islands. The highest fall for 24 hours occurred at Butiaba on July 26th when 7·61 inches were registered.

7. Weather conditions were thus generally favourable for the growth of all crops, although there were marked variations according to districts. The dry period during July delayed cotton planting in the Lake areas, and as this is the optimum season for these areas the yield of the crop will be adversely affected.

Exports.

8. The total value of domestic produce exported from the Protectorate during the year amounted to £2,059,954 compared with £4,274,755 for the preceding twelve months. The drop in value of exports is mainly accounted for by the lower prices for cotton lint and seed coupled with the reduced crop. The value of ginned cotton exported amounted to £1,555,344, representing 129,122 bales and 75·8% of the total exports, compared with £3,312,667 representing 204,057 bales in 1929.

A table showing the details of exports for the year is given below, and comparative tables will be found in appendices:—

Description.	*Quantity.*	*Value. £*	*Per cent.*
Cotton, raw	516,484 centals	1,555,344	75·8
Coffee, raw	2,726 cwts.	154,995	7·5
Cotton seed	33,578 tons	137,387	6·7
Metalliferous ores, non-ferrous	351 tons	55,300	2·6
Hides (dry and dry salted)	21,492 cwts.	49,518	2·4
Simsim	1,416 tons	17,964	0·9
Rubber, plantation	6,270 centals	16,314	0·8
Groundnuts	1,289 tons	15,123	0·7
Ivory	302 cwts.	13,632	0·6
Tobacco, unmanufactured	123,659 lbs.	5,544	0·5
Tobacco, cigarettes	20,707 lbs.	5,405	
Sugar, refined	6,670 cwts.	8,713	0·4
Skins, sheep and goat	205,200 No.	7,670	0·3
Chillies	3,078 cwts.	7,578	0·3
Other exports	...	9,467	0·5
		£2,059,954	

9. (*a*) *1929-30 Crop.*—Cotton buying opened on January 27th in all districts of the Eastern, Northern and Buganda Provinces and in the Toro District of the Western Province.

The output from the Eastern Province amounted to 30,406 tons of seed cotton, as compared with 63,575 tons in the previous year. The abnormally low average yield of 162 lbs. per acre was due to the failure of the crop due to unfavourable weather conditions followed by blackarm disease.

In Buganda Province 38,772 tons of seed cotton were marketed against 49,527 tons in 1929, giving an average yield of 436 lbs. per acre.

The Northern and Western Provinces produced 4,120 tons and 356 tons respectively.

In Buganda the buying season opened with the Buganda Seed Cotton Buying Association operating in all parts of the Province. This Association included all the ginneries operating in the Province, but was dissolved by mutual agreement on March 31st. An interesting feature of the marketing in Buganda later in the season was the formation of a ginning company in which, for the first time, natives were directly interested. In no other part of the Protectorate did the Associations of ginners continue to function.

(*b*) *1930-31 Crop.*—Owing to the serious effect of "blackarm" disease on the crop in the areas of the Eastern Province north and east of Lake Kioga, it was considered inadvisable to utilise the seed from 1929-30 crop grown in these areas for planting, and 1,730 tons of seed were purchased from ginneries in South Busoga, where blackarm damage had been practically absent. This was transported to and distributed throughout the affected areas at a total cost of slightly over £8,000. The table below gives the approximate figures of acreages planted in the various districts during 1930. The figures for 1929 are given for comparison.

	1930.	*1929.*
EASTERN PROVINCE.		
Busoga District	132,890	111,324
Budama ,,	31,816	33,814
Bugwere ,,	107,484	77,038
Bugishu ,,	26,793	33,041
Teso ,,	118,813	107,670
Lango ,,	66,757	57,015
TOTAL ACRES	484,553	419,902
BUGANDA PROVINCE.		
Mengo District	99,506	96,093
Entebbe ,,	41,023	47,299
Masaka ,,	25,600	28,000
Mubende ,,	28,500	27,643
TOTAL ACRES	194,629	199,035

	1930.	1929.
NORTHERN PROVINCE.		
Bunyoro District	15,000	15,600
Gulu ,, ...	19,915	17,000
Chua ,, ...	12,000	6,800
West Nile ,, ...	6,580	—
TOTAL ACRES	53,495	39,400
WESTERN PROVINCE.		
Toro District	6,000	,100
Ankole ,, ...	1,013	,720
TOTAL ACRES	7,013	4,820
GRAND TOTAL ...	739,690	663,157

In a country such as Uganda where the cotton crop is produced on hundreds of thousands of small plots of all shapes and sizes, it will be realised that any accurate estimate of acreage is impossible. In the Eastern Province, however, where the staff is sufficient to make it possible, an improved system of sample plot measurements has been evolved whereby the acreages of all crops are based on computations made from the average of these sample measurements weighted for population and used as a basis for conversion of number of plots into acreages. This system came into operation this year and it is felt that a true picture will be obtained not only of the relative fertility of the different areas of the Province but also of each area over a period of years.

Dry weather was experienced during June and the first half of July, and in consequence cotton planting was delayed.

In the Eastern Province good rains were experienced during the latter half of July and throughout August and September, and a satisfactory acreage was planted under good conditions.

In Buganda Province the weather conditions remained dry during August and in consequence a large proportion of the crop was late planted in this Province.

A dry December enabled the early planted cotton to ripen under ideal conditions and the earlier pickings were very clean, with a staple and grade above the average. Later plantings suffered to some extent from the dry weather of December, but in general a crop slightly above normal is anticipated.

By a normal crop is meant the probable crop which is to be expected if the increase as shewn by the averages of five-year periods is maintained and normal growth conditions are experienced.

The graph at Fig. I. shows the annual production in periods of five years, and the curve so obtained has been projected in what seems to be a reasonable manner so that the probable crop in any year can be read.

It will be seen that the probable crop for the 1930-31 season is slightly over 170,000 bales.

(*c*) *Transport.*—The Jinja—Kampala extension of the Kenya and Uganda Railway was to all intents and purposes completed by the end of the year, and the first through connection between Kampala and the coast was obtained by the opening of the Nile Bridge by His Excellency the Governor on January 14th, 1931.

With the completion of this extension most of the cotton crop of the Protectorate will now be transported by rail direct to Mombasa, thus avoiding the double handling which occurred when the Buganda crop was shipped *via* Lake Victoria.

Motor transport is still an increasing factor in the movement of the crop and it would appear to be the exception rather than the rule for the grower to market his crop by direct head load. A disadvantage of this method is its expense and consequent reduced price to the grower.

(*d*) *Cotton Seed.*—With the increased railway facilities now operating the economic zone for the export of cotton seed has been considerably widened for normal years, but the drop in price during 1930 caused a reduction in the exports for that particular year.

The total quantity of cotton seed exported during the year amounted to 33,578 tons, valued at £137,387, compared with 67,523 tons valued at £424,000.

(*e*) The number of ginneries licensed to gin and bale cotton during the year was 123, compared with 153 in 1929. Ginnery holdings at the end of the year were as follows:—

	Number of ginneries.
Indian	148
European	39
Japanese	6
	193

(*f*) *Cotton Grading.*—During the year the Cotton Grader visited as many ginneries as possible in Teso, Bugwere, Bugishu, Budama and Busoga, spending three days at each working ginnery.

On the whole he reported that the ginning of the crop was satisfactory, but in many cases sufficient care was not exercised in excluding damage to the lint by oil-stains and in the supervision of pressing.

He reported that: "The quality was Fair to Medium Grade and would average Good Fair to Good (Liverpool grades) and staple from a soft style of 1⅛ in Teso, to Busoga District which was shy full 1⅛ to full 1⅛."

(*g*) *Cotton Tax.*—The amount of tax collected during 1930 was £136,333, as compared with £230,988 in 1929, the basis of taxation being five cents and six cents respectively.

(*h*) *Local Trading.*—Local transactions in baled cotton during the year were numerous, and particulars of registered contracts representing 146,663 bales were recorded.

It will be seen that this figure exceeds the total cotton crop for 1930, and is to be accounted for by the fact that with the small crop there was keen competition amongst buyers who had made forward contracts for the Bombay market.

More and more of the crop is finding its way eastward to the Bombay and Japanese markets, and a noteworthy feature of the past few seasons has been the increasing value attached to Uganda cotton in these markets and the consequent increase of local prices above Liverpool parity.

The following table gives details of the countries to which direct shipments of cotton were made during the year under review and for the two previous years:—

	1930.		*1929.*		*1928.*	
	Bales.	%	*Bales.*	%	*Bales.*	%
Great Britain ...	9,197	7	44,726	22	49,304	35
India ...	112,513	88	118,529	60	76,304	56
Japan ...	6,814	5	55,139	18	12,728	9

Coffee.

10. (*a*) The following table gives particulars of the acreage under cultivation under two heads, native and non-native, and gives the acreage in 1929 for comparison:—

	C. Arabica.		*C. Robusta.*	
	1930.	*1929.*	*1930.*	*1929.*
Non-natives ...	13,449	13,837	5,679	5,759
Natives	6,672	5,417	15,816	10,971
	20,121	19,254	21,495	16,730

It will be noted that for the first time the acreage cultivated by natives has exceeded that of non-native coffee.

The drop in prices which occurred towards the end of 1929 and the lower prices ruling during 1930 have prohibited any further increase by non-natives of the acreage under this crop during the year under review.

The native coffee industry showed a steady expansion, and the free distribution of *C. robusta* seedlings continued throughout the year in the Buganda Province. In the Ankole District of the Western Province and in the Bugishu District of the Eastern Province the cultivation of *C. arabica* by native cultivators is making good progress.

A report on European coffee growing by the Coffee Officer will be found on page 26, whilst the report of the Senior Agricultural Officer in charge of agricultural work in the Eastern Province on page 13 gives particulars of the native-grown *Coffea arabica* industry in Bugishu.

(*b*) In the Toro District, where the bulk of the non-native *Coffea arabica* industry is situated, a serious outbreak of *Antestia lineaticollis* (Variegated Coffee Bug) occurred and reduced the yield considerably on most estates. The planters organized a campaign to test the efficacy of hand picking of the bug and spraying, but at the end of a six months' period the position cannot be said to have materially improved.

The position is not satisfactory and consideration is being given to the question of evolving other means of control which may prove better applicable to climatic conditions in that area.

(*c*) Much of the coffee, particularly the native-grown *Coffea robusta*, leaves the country in an unsatisfactory condition, and with the object of improving the grade of coffee exported legislation was passed providing that on and after a date to be notified, all hulled coffee must have passed through a licensed curing works and be supported by an export certificate.

At present the export of native-grown coffee has not reached large proportions, but it is felt that the introduction of a Coffee Grading Ordinance at this early stage will encourage the production of a high grade coffee.

(*d*) The exports of coffee from the Protectorate during the year amounted to 48,858 cwts. valued at £155,001, as compared with 41,192 cwts. valued at £177,142 for 1929.

Rubber.

11. (*a*) With the very heavy decline in prices during recent years, the tapping of Para rubber (*Hevea brasiliensis*) has temporarily ceased to be an economic proposition in Uganda, where it is doubtful whether the growth of this crop can be successfully carried out if world prices for rubber are below 8d. per lb. Tapping has, however, continued on a few estates, and small quantities have been exported, the figures for 1930 being 627,000 lbs. valued at £16,314, as compared with 823,100 lbs. valued at £28,818 in 1929, and 1,131,200 lbs. valued at £54,978 in 1928.

(*b*) It is evident that if rubber is to be a paying proposition in Uganda, more attention will have to be paid in the future to increasing the yield per acre. With this object in view, experiments are being carried out on the budding of rubber from high yielding mother trees, for which purpose mother trees on the Kampala Plantation and Entebbe Botanic Gardens, whose yield has been recorded over the last four years, are being used.

The best of these trees yielded an average of 25·7 ozs. of dry rubber per month over a period of 43 months.

Fuller details of this work will be found in the report of the Economic Botanist in Part II. of this Report.

Tobacco.

12. (*a*) So far the acreage under this crop is not large and in the case of native-grown tobacco in Bunyoro for local consumption, is restricted by the issue of seedlings from departmental nurseries so as to satisfy the requirements of the British-American Tobacco Company's cigarette factory at Jinja.

Tobacco as a native industry cannot yet be considered to have passed the experimental stage.

One point standing out clearly in market reports on Uganda plantation tobacco is that if Uganda tobacco is to find and maintain a place on the home market, more attention will have to be paid to grading and packing of the leaf, as manufacturers will expect our tobacco to be equal to other Empire leaf in these respects.

With a view to testing the export market for native-grown tobacco 25 acres in Bunyoro are being grown especially for export.

In the event of this shipment proving to be satisfactory, a small Government tobacco packing factory, which has been built at Masindi, will be utilised for dealing with any native production for export for the next few years.

The report of the Tobacco Officer will be found on page 24.

(*b*) Exports for the year, including both unmanufactured tobacco and cigarettes, amounted to 144,366 lbs. valued at £10,949, as compared with 61,967 lbs. valued at £3,040 in 1929.

(*c*) A report by the Imperial Institute on air-cured tobacco will be found in Appendix No. II.

Sugar.

13. As mentioned in the report for 1929, there are at present two sugar estates equipped with the full plant capable of producing a high quality refined sugar, with a total acreage under cane of 6,700 acres.

The bulk of the output from these two factories is absorbed locally, but 6,670 cwts. valued at £8,718 were exported to neighbouring territories.

In addition to the production of sugar one of these factories produces power alcohol and methylated spirits and has commenced production of perfumes.

Miscellaneous Crops.

14. (*a*) *Tea.*—The acreage under tea was increased from 321 acres in 1929 to 360 acres in 1930. The cultivation of this crop is confined almost exclusively to European planters.

(*b*) *Sisal.*—As mentioned in the report for 1929 an area of land has been leased at Masindi Port for development as a sisal estate and during the year 1,200 acres were planted up.

(*c*) *Oil Seeds, Groundnuts and Simsim.*—During the year under review there was a considerable increase in the area under groundnuts and if proper marketing facilities and decorticating arrangements be made this crop has possibilities of developing into one of prime importance particularly on the lighter soils of the Eastern Province. As mentioned in the report of the Senior Agricultural Officer in charge of agricultural work in the Eastern Province, trial markets were held at various centres.

The export figures for these two crops are as follows:—

	1930		*1929*	
	Tons.	*Value.*	*Tons.*	*Value.*
		£		£
Groundnuts ...	1,289	15,123	316	5,419
Simsim ...	1,416	17,964	1,338	24,890
	Gals.		*Gals.*	
Simsim Oil ...	2,522	467	1,678	464

(*d*) *Maize.*—The increase of acreage under this crop has been maintained, and areas were planted up with improved varieties of maize; excellent yields of this crop can be obtained in Uganda, particularly on the heavier soils in the areas bordering on Lake Victoria, but the extension of production of this crop is at present limited by lack of suitable local milling facilities, though it is hoped that in the near future Uganda will be self-supporting in this respect.

Experimental Stations.

15. Four Departmental Experimental Stations are maintained, in addition to the Botanic Gardens at Entebbe. These are situated at Bukalasa, Serere, Kampala and Bugusege.

(*a*) *Bukalasa Plantation*, situated in Buganda Province, is the headquarters of the Cotton Botanist, and in addition to the work of the Cotton Botanist, cultural experiments and breeding work are done on annual crops, such as maize, groundnuts, simsim, muhogo, sunn hemp, sweet potatoes, plantains, etc.

Experimental work on *Coffea robusta* is also carried out at this station.

(*b*) *Serere Plantation*, in the Eastern Province, is the headquarters of the Senior Agricultural Officer in charge of the work of the Department in that Province, and also of the Assistant Cotton Botanist.

In addition to the cotton breeding work carried out by the Assistant Cotton Botanist the station serves two purposes, a portion of the station being utilised purely as a seed farm, and the other portion for experimental work on groundnuts, simsim and maize.

On the seed farm 50 acres of cotton are grown, the seed from which supplies the Mulondo segregated area—the first bulk stage in the Eastern Province scheme of cotton seed control.

Seed of other crops grown on the seed farm are distributed to native cultivators through the medium of small increase plots scattered over the area to be served.

(*c*) *Kampala Plantation*, in the Buganda Province, is situated alongside the Agricultural Laboratories. On account of building extensions in Kampala the area of the plantation has been gradually reduced, and the work carried out is mainly concerned with permanent crops such as rubber, coffee, tea, citrus fruits. In addition to this, small areas are taken up with plot experiments of the Laboratories Division, and a recent development has been the working up of stocks of various essential oil plants, both indigenous and exotic. From a nursery attached to the plantation, a large number of *Coffea robusta* seedlings are distributed annually to native growers.

(*d*) *Bugusege Plantation*, in the Eastern Province, is situated in the foothills of Mount Elgon and work at this station is confined to experiments on pruning, shading, green manuring and mulching of *Coffea arabica*.

Subsidiary stations are also maintained from departmental funds at Kakumiro and Buwunga in Buganda Province. In addition to these departmental stations three small demonstration and experimental plantations have been established and are being maintained by the Native Administration at Ngetta, Kamuge and Bubulu in the Eastern Province, and funds have been allocated and a site chosen for the establishment of a fifth of these near Jinja. The work at these plantations is designed and controlled by this Department.

The aim of these Native Administration plantations is to carry out extension work on the experiments laid down at the major stations, to carry out mass selection on native food crops, to demonstrate sound agricultural practice and to increase supplies of selected seed of all crops prior to distribution to native growers.

A certain amount of experimental work is also carried out at the Botanic Gardens, Entebbe.

Reports on the experimental work carried out during the year on the various stations will be found in Part II. of this report.

An historical account of the formation and development of the Botanic Gardens, Entebbe, is published as Appendix No. I. of this report.

Agricultural Education.

16. The report of the Superintendent of Agricultural Education will be found on page 20.

As mentioned in the report for 1929, arrangements were being made for the establishment of the three months' courses in agriculture for all Elementary Schoolmasters after leaving the Normal Schools and prior to their taking up teaching posts, and two such courses were held at Bukalasa during the year, with satisfactory results. Arrangements have now been completed for these courses to be held at Serere during 1931.

Laboratories Division.

17. The reports of the Cotton Botanist, Entomologist, Mycologist, Agricultural Chemist and Economic Botanist will be found in Part II. giving full details of the work carried out in the various sections of the Laboratories Division during 1930.

Agricultural Statistics.

18. The usual statistical information will be found in the appendices at the end of Part I. of this report.

J. D. TOTHILL,

Director of Agriculture.

ANNUAL REPORT ON AGRICULTURE IN THE EASTERN PROVINCE.

Meteorology and Effect on Crops.

The normal weather of the early part of the year is "dry season" with hot dry winds and high temperature. It was unsually cool and the maximum temperature was only above 90 on three days in January and this cool weather led up to heavy rain in early February. For once the native practice of sowing bulo (*Eleusine Coracana*) in January was justified. Rains were normal until the end of June and were very favourable to the grain crop. July had the lowest rainfall yet recorded for this month. The bulo ripened off and a bumper crop was harvested. The dry weather had an adverse effect on the oil seed crops and delayed cotton planting. Rainfall subsequently was above the average until November and this period was notable for the violence of the storms and frequency of hail.

Thus, although cotton planting was much delayed by drought, the late planting had excellent conditions for growth. Unfortunately November was unusually dry and a fine flush of flowers met severe conditions which caused a great deal of boll shedding. In early December heavy rain fell and this was succeeded by normal "dry season."

Cotton.

(1) Marketing of 1929—1930 Crop.—The 1929—1930 season can be included among the worst, the cause being damage done by black-arm disease. This reduced the crop throughout the Province except in the southern part of Busoga. At one time it was thought that the later plantings would bring up sales to better total but these hopes were not realized, the abnormal rains of February being the cause.

The following table gives statistics relative to the 1929—1930 season :—

District.	*Acreage.*	*Sales in Tons.*	*Yield per acre. Lbs.*
Busoga	111,324	15,114	299
Budama	33,814	2,658	176
Bugwere	77,038	3,046	88
Bugishu	33,041	1,565	107
Teso	107,670	2,902	60
Lango	57,015	5,011	192
	419,902	30,296	Mean: 153·7

The combination of ginners into Buying Associations, which had been a feature of the previous year's marketing, was not repeated, and although negotiations took place any chance there may have been of a large Association being formed was upset by the rivalry of two leading Indian firms. Competition to get cotton was considerable and raiding into the territory of neighbouring ginneries by means of motor lorries was much in evidence.

(2) 1930—1931 Crop.—The acreage of cotton planted in 1930, as given in the table below, is calculated in two ways. The "new method" figures were obtained by calculation from the returns made by the chiefs, and the plot measurements made by the native agricultural staff. The latter provide material for the culculation of the average plot size for each district and these district means have been used for the first time this year.

	Acreage 1930-1931.		
District.	*New Method.*	*Old Method.*	*Acreage 1929-1930.*
Busoga	132,890	125,807	111,324
Budama	31,816	31,816	33,814
Bugwere	107,484	78,712	77,038
Bugishu	26,793	22,326	33,041
Teso	118,813	129,344	107,670
*Lango	66,757	66,757	57,015
Total ...	484,553	454,762	419,902

*All the Lango figures in the table were worked out by the old method and plot measurements and calculations were not made in the absence of an Agricultural Officer.

PERCENTAGE MONTHLY COTTON PLANTING (APPROX.).—

	May.	*June.*	*July.*	*August.*	*September.*
Busoga	0	2	13	65	20
Budama	0	3	27	58	12
Bugwere	0	6	28	53	13
Bugishu	0	10	43	43	4
Teso	7	33	35	25	0
Lango	1	19	42	38	0

It will be seen from the table that Teso was as usual the earliest cotton district and Busoga the latest. The percentage plantings by months for the whole Province are given below:—

	1930-1931.	*1929-1930.*	*1928-1929.*
	%	%	%
May	1·7	2	3·5
June	13·5	13	21·0
July	28·4	37	42·0
August	46·9	33	29·0
September	9·5	15	4·5

Owing to the exceptionally dry July, the 1930 cotton crop was very late, about 56% of it being planted in August and September and much of it encountered dry weather conditions resulting in bud and boll shedding. This reduced the yield of what was an unusually promising crop, but even so good yields were realized, the early cotton yielded well, and prospects are favourable.

This report is being written during the buying season and it is possible to anticipate a total crop of 60,000 tons of seed cotton. Such a total would be among the largest, and considering the alarm which was felt at the failure of the previous year's crop owing to black-arm disease it would seem advisable to put on record the history of the disease and the action taken to meet it.

(3) BLACK-ARM (*Pseudomonas malvacearum*).—This disease, although common as angular leaf spot for many years, did not appear in its destructive form until 1928, when about 20,000 acres in North Teso were affected. Seed was sent up from a healthy part of the district to replace it, but in 1929 that area and the whole of the Province with the exception of Southern Busoga and Western Lango were badly attacked. The yield was much reduced and in large areas no more than one-fifth of the normal crop was picked. The cotton in the area supplied with healthy seed was as bad as anywhere; but apart from the question of the disease all the seed except in South Busoga showed a serious decline in weight. In some parts the seed weight was 40% below normal and it was considered desirable to replace the seed for planting in the badly affected areas. 1,730 tons of seed were purchased from ginneries in South Busoga and despatched by railway and lake steamer services to Lango, Teso, and Bugwere and distributed for planting (1930). In the resulting crop angular leaf spot was general, and as early as August the early plantings at Serere were suffering from the black-arm form of disease. This spread through the crop and at one time prospects seemed to be bad, but as recorded above a very satisfactory crop has materialized throughout the Province.

Black-arm caused some damage but made no progress later in the year. The following figures, which are means of soil temperatures taken at one foot depth, at Serere, are of interest in connection with the possible influence of soil temperature on the incidence of the disease:—

	1928.	*1929.*	*1930.*
May	76·5	77·2	78·4
June	76·8	79·5	77·5
July	76·8	75·4	77·6
August	77·4	77·9	78·6
September	82·4	78·6	79·8
October	79·8	78·3	80·5
November	80·4	79·2	82·7

Soil temperatures were higher than for the past two years.

An experiment was laid down at Serere to compare the incidence of black-arm on cotton grown from heavily infected, lightly infected, and healthy seed, and results of some interest were obtained. The subject will be fully discussed in the report on Serere Experimental Station, 1930.

(4) INCREASE OF S.G. 29 COTTON.—Only 45,106 lbs. of seed resulted from the S.G. 29 cotton planted in the Mulondo Segregated Area in 1929 instead of a quantity sufficient for 7,000—8,000 acres which had been expected. It was therefore necessary to choose an area containing a ginnery at which a high proportion of the crop could not fail to be sold. The Kadunguru peninsula fulfils these conditions and the seed was issued in Kadunguru Gombolola and in the neighbouring mitalas of Obukito, Apapai, and Bululu so as to make it probable that all cotton bought at Messrs. Foster Brothers' Kadunguru ginnery would be S.G. 29 cotton. It was estimated that 3,228 acres of S.G. 29 were planted.

At marketing time all growers of S.G. 29 were lent gunny bags marked in a distinctive way with green stencil ink. Any unmarked bags of cotton bought at Kadunguru ginnery were stored separately from the rest, and cotton bought in marked bags at other ginneries in

the neighbourhood was put on one side. If necessary the seed from these outside ginneries will be used, but at the time of writing it seems likely that eleven lakhs of seed cotton will be obtained at Kadunguru ginnery which should provide enough seed for the next stage, when 50,000 acres will be grown in Ngora, Serere, and Kasilo counties.

S.G. 29 was again planted in the Mulondo segregated area. 400 acres were put in and a very good crop resulted. The seed from this will be available to start another 7,000-acre "pocket" in another large unit into which the Eastern Province has been divided for the purposes of putting an improved strain of cotton into general cultivation.

(5) Trial Plots.—The results of the adjacent pairs of quarter-acres S.G. 29 plots tested against N. 17 proved to be helpful in showing areas where the new cotton would be likely to be successful, and it appears that the 7,000-acre pocket should be in Teso—Bugwere in 1931 and in Bugwere proper in 1932. This would result in 200,000—220,000 acres of S.G. 29 being in cultivation by 1933.

The quarter-acre comparisons were planted with the strain S.G. 23·8 against N. 17 in 1930.

Coffee.

(1) Marketing of 1929—1930 Bugishu Crop.—In accordance with arrangements made with the District Commissioner and the leading buyers, temporary markets were constructed at suitable centres at which the buyers were licensed to purchase coffee, all outside buying being prohibited.

Unfortunately the institution of markets coincided with a decline in the price and only 20—22 cents per lb. was paid. An unexpected result of holding markets was that the buyers formed a ring and appeared to be under some agreement to sell to one exporting firm.

On the whole the coffee brought in was well washed, though some discoloured samples were seen. The Agricultural Officer was present at each market and was able, with the co-operation of the buyers, to turn away wet coffee and instruct any who brought it to return after thoroughly drying it.

Thus this system of marketing was useful in improving the grade, but in other respects it was not satisfactory and proved to be very unpopular with the sellers.

The estimated total sales were 103 tons, which was a smaller crop than the previous year's by 27 tons.

(2) The 1930—1931 Crop.—The Agricultural Officer in charge of coffee work in Bugishu, Mr. N. S. Haig, reports as follows:—

"Heavy flowering in January and February, 1930, took place in all areas, and a large crop was indicated, which was later borne out by the large sales.

Distribution and planting of young trees was done from April onwards, the total number of trees planted during 1930 being as under:—

North Bugishu	46,382
South Bugishu	162,455
Central Bugishu	17,850

This represents an acreage of approximately 324 acres, and brings the total acreage planted in Bugishu to the end of 1930 to 1,962 acres. Owing to deaths of trees at planting-out time, and from other causes, this acreage is obviously incorrect. Coffee Instructors have made counts of the actual number of trees per gombolola, and this gives the following acreage:—

North Bugishu	921
South Bugishu	625
Central Bugishu	68
Total	1,614

Towards the end of the year, the Director of Agriculture toured part of Bugishu District. To economize space and ensure that the ground is more efficiently covered, it was decided to reduce the planting distance between coffee rows from 8 ft. to 6 ft. This will come into effect from the begining of 1931. At the same time, an experiment will be laid down at Bugusege to compare various spacings, ranging from 4 ft. to 8 ft. Mulching with dry banana leaves is being taken up more and more by natives. In addition to the leaves, natives are now being encouraged to use split banana stems.

As regards pruning, the single stem system has now been proved to be unsuitable for the lower altitudes in Bugishu, although in the higher gombololas, trees pruned on this system remain in good health and produced large crops. Dieback in 1930 has been very prevalent, especially in the area between Buwalasi and Nakuyu in North Bugishu. It is considered that this has been brought on by the unusually heavy crop of cherry this year, combined with the method of pruning in force whereby the coffee trees are topped at 5 ft. in height. From now onwards all young trees will be topped in the nursery beds at a height of 6 inches from the ground, thus producing two main stems. The trees will be distributed to native growers in this condition, and no further pruning will be done to them; this will be the policy until definite data have been obtained from the pruning experiments at present under trial at Bugusege.

Marketing of the crop was busiest during December, but there were still fair quantities of parchment coffee not sold at the end of the year; from figures obtained from the chief buyers, it is estimated that the crop will reach 300 tons, which is approximately three times that of last year. Definite markets were not organized this year. Prices have been higher than was anticipated and the average price per lb. paid to the growers has been 29—30 cents. The Bugishu Native Administration bought a certain quantity this year, but in view of the fact that the building of a coffee factory at Bubulu and the other three pulping stations has not been commenced, it was decided not to attempt to buy a large proportion of the crop. On completion of these buildings, it is proposed to buy the coffee in the cherry, to pulp it at the four pulping stations (Bubulu factory will include a pulping plant), to hull and clean it at Bubulu, and if necessary ship direct to Europe.

Although there are now thirty pulping machines scattered through the coffee-growing areas, much of the cherry is still hand-pulped, owing to the distances from the nearest pulper.

Pests and Diseases.—The Coffee Berry Borer does not appear to have increased to any appreciable extent. This pest is limited to the lower altitudes, *i.e.*, up to approximately 5,500 feet. The Stem Borer has been dealt with in the few areas where it occurs, and *Bug* has not been much in evidence.

As regards diseases, *Hemileia* appeared on many trees when picking was nearly over, but did very little damage."

(3) Experimental Work at Bugusege Plantation.—Reference is made above to the unsuitability of the single stem system of pruning for the lower altitudes of Bugishu; it is important that information should be obtained with regard to pruning and that a system capable of being practised by natives should be devised and tested. This is being done at Bugusege on the departmental Coffee Experiment Plantation. The plantation pruning systems Single Stem, Multiple Stem, and Agobiada, are being tested in a replicated experiment. Mr. N. S. Haig, Agricultural Officer, reports that the order of yield in the first crop which was picked in 1929 was as given, but in the 1930 crop "although there still remains some coffee to be picked it is evident that the position will be exactly reversed." It is not advisable to draw definite conclusions yet in what must be a long term experiment, but it is significant that the single stem system is beginning to fail owing to exhaustion and die-back of the trees. A modified and simple form of the multiple stem system is being compared with natural growth and single stem in another experiment. A manuring experiment to test several methods of covering the land with green manures, weed cover and banana leaf mulch was begun in 1930 with trees pruned on the single stem system and approaching the bearing stage. This experiment is to be duplicated in 1931 using trees pruned on the modified multiple stem system and including mulching with banana stems.

Two other experiments to be begun in 1931 are the spacing experiment and the shade experiment. In the latter the shade will be provided by erecting frames covered with split bamboo over the plots, and the treatments will be arranged to simulate various types of deciduous shade tree by removing the shade at the different periods before the flowering of the coffee, while there will be also the permanent shade, and no shade.

The object of these spacing, shade, pruning and manuring experiments is to find out what cultural treatment is most suitable to Bugishu coffee, and particularly to find the best method of inducing the trees to bear regularly without the overstrain which occurs in some seasons at the lower altitudes.

Information is also being sought as to the variation in yield between single trees in order to decide on the most economical size of plot for future experiments.

(4) Robusta Coffee.—A start has been made with the encouragement of this crop in Busoga, and Mr. R. T. Wickham, Agricultural Officer, reports as follows:—"A few pounds of selected seed were sent by the Botanist in January and February, and were sown at Iganga and in the Forestry nursery beds near Jinja. Some 500 of the subsequently potted plants have been taken by the natives, and some 4,000 remain to be collected and planted out during the coming rains."

Oil Seeds.

(1) The season was not a good one for the growth of oil seed crops, the drought in July considerably reducing the yield of both groundnuts and sim-sim. The acreages planted in each district are given below:—

District.	*Groundnuts.*	*Sim-sim.*
Busoga	5,915 ...	3,526
Budama	1,282 ...	2,123
Bugwere	7,535 ...	15,527
Bugishu	1,444 ...	520
Teso	30,919 ...	8,857
Lango	17,897 ...	48,126
Total	64,992 ...	78,679

Lango figures estimated by old method.

(2) Groundnuts.—It will be seen that by far the largest acreage of groundnuts is grown in Teso, and in proportion to the population, the lighter soils of Lango and Bugwere have a considerable production.

Owing to the importance of cotton in these areas the trade in groundnuts has not developed very far and the bulk of the crop is consumed as food. There has been in the past some trade in the villages conducted by wandering buyers, and this went on during the year under review. However, it was decided to assist such exporters who required to buy in bulk by holding trial markets. These were arranged at seven centres in Teso, each market lasting two days. The producers were asked to bring only shelled nuts for sale and this was done. The first market held at Toroma on September 15th showed that the nuts had not been properly dried after shelling, and the people were sent home and the market postponed. At other markets the produce was sold in good condition and a total of 320 tons changed hands. After the markets were over buying was continued in the ordinary way.

When the home price was at £13 to £14 per ton the native was receiving 5—6 cents per lb. for shelled groundnuts, but with the further slump to £9 10s. per ton very little trade was done. At the former figure and above it there could be a considerable development of the groundnut trade.

The figures shown in the following table were derived from returns of traffic at the stations and ports of the Kenya and Uganda Railway in the Eastern Province:—

	Groundnuts. Tons.	*Sim-sim. Tons.*
Busoga	— ...	21
Bugwere	235 ...	93
Teso	996 ...	298
Lango	22 ...	509
Total ...	1,253	921

(3) Sim-sim.—Lango is the most important sim-sim district. The acreage quoted may possibly be an over-estimate but there has been for many years more production than elsewhere. It is on the good soils of Kumam area where sim-sim does well, and there has always been some trading in the crop. A certain amount of sim-sim was sold at the Teso groundnut markets but the bulk of it was sold in the old way. The price paid was round about 5—6 cents per lb.

(4) Development of Oil Seed Production.—It is evident from the acreages of groundnuts and sim-sim that there is already a considerable production but that most of the crop is used as food. The rotation trial plots are beginning to show that while in some places both groundnuts and sim-sim can be grown in rotation with cotton, in almost all cotton growing areas either one or the other is successful. It is surprising, therefore, that the cotton ginners take so little interest in these crops. They have excellent buying facilities, plenty of storage room, and machinery which could be used, in the case of groundnuts, for driving decorticating plant.

Further, the groundnut crop is harvested from July onwards and the buying season coincides with the off season for cotton. But little increase of cultivation can be expected unless the grower knows that he can dispose of his crop reasonably near to his own place, and unless cotton firms become interested in oil seed business, other marketing facilities will be necessary. Temporary markets do not solve the problem. The buyers take the risk of rain spoiling the produce, and the sellers have to sell quickly or not at all. A better system would be to allow buyers to erect mud and wattle stores at suitable centres and for them to buy under license during a period of three months at the end of the year.

Maize.

Good seed of Hickory King maize was made available to natives wishing to grow it by a system of increase plots in each muruka, in which seed from Serere and Ngetta was planted. This system was adopted throughout the Province and some increase in the acreage of maize resulted. It was evident, however, that while maize yields well in all districts, it cannot be considered as an exportable crop at prices likely to be ruling for some time to come, and the encouragement of its cultivation will be confined to the southern part of the Province where the produce may expect to meet a local demand.

Ploughing.

(1) Lack of money proved to be a limiting factor in the progress of native ploughing. It is in Teso that ploughing has become generally popular and it was this district that suffered most from the failure of the cotton crop. There was little money available for purchasing ploughs so that the increase of 253 ploughs over the figure given in the last Annual Report is considered to be satisfactory. The native ploughing instructors were as usual engaged in training cattle for new plough owners and giving assistance with the spanner when on tour.

Ploughing in Bugwere made good progress and the Agricultural Officer reports an increase of 250 ploughs. The following table gives the number of, and areas in which, ploughs are most used :—

Teso District.	*No. of Ploughs.*		*No. of Ploughs.*
Napak	385	Serere	323
Usuku	588	Kasilo	157
Amuria	647	Kumi	2,356
Soroti	756	Ng'ora	1,211
		Total	6,423
Bugwere District		... ...	2,555

(2) In other districts there is not much progress to be reported although every opportunity is taken to encourage the use of ploughs. The Agricultural Officer, Jinja, Mr. R. T. Wickham, reports as follows :—"Two ploughing schools have been started at Ndulia (Buyende), Bugabula, and Nsinze, Kigulu, at the same time two of the more progressive chiefs, Musa Kaduyu and Firimoni Kireri, both near Nsinze, have co-operated and trained men and cattle. Altogether 115 cattle and 11 boys have been trained during the last five months of the year in addition to a number of assistants who may be said to be partially trained."

In Lango the ploughmen engaged on the 100-acre clearings, after finishing work on the blocks, were sent out to demonstrate and about 140 acres were ploughed. With the posting of a European Ploughing Instructor to the Province, it will be possible to give more attention to ploughing in Lango and it is proposed to open two ploughing schools in 1931 for the training of men willing to take up ploughing as a means of livelihood.

(3) In Teso the time has now arrived for the use of other implements. There are a number of native plough owners who grow upwards of five acres of cotton and these men find it difficult to keep their plots clean by hand. The Ransome "Midget" Cultivator was tested on the farm at Serere and found to be a suitable implement for the inter-cultivation of cotton. It is a five-tined single ox cultivator. In order to bring it to the notice of the people it was sent on tour with a competent native ploughing instructor and demonstrated in nearly every gombolola. The work done in cotton created great interest and it is expected that the cultivator will become popular when the people have more money to spend. These cultivator demonstrations are to be repeated in the coming season.

Stumping and Clearing Scheme.

The clearings which were begun during 1929 were extended at Ngetta, Awelo, Aduku and Kabwangasi, a second 100 acres being brought into cultivation at each place. At Busia a new 100-acre block was opened. The cropping of these blocks since the commencement of the scheme is given below :—

District.	*Site.*	*Cropping.*
Budama	(1) Mazimasa ...	(*a*) Maize, (*b*) Sim-sim and Groundnuts, (*c*) Cotton.
	(1) Busia ...	(*b*) Maize.
Bugwere	(1) Kabwangasi ...	(*a*) Cotton, (*b*) Sim-sim, (*c*) Cotton.
	(2) Kabwangasi ...	(*b*) Cotton ($\frac{1}{2}$), Mpindi ($\frac{1}{2}$).
	(1) Kamuge ...	(*a*) Simsim, (*b*) Cotton.
Lango	(1) Aduku ...	(*a*) Cotton, (*b*) Maize, (*c*) Cotton.
	(2) Aduku ...	(*b*) Cotton.
	(1) Awelo ...	(*a*) Cotton, (*b*) Maize, (*c*) Cotton.
	(2) Awelo ...	(*b*) Cotton.
	(1) Ngetta ...	(*a*) Cotton, (*b*) Maize, (*c*) Sim-sim.
	(2) Ngetta ...	(*b*) Cotton.

(*a*) Late rains 1929. (*b*) Early rains 1930. (*c*) Late rains 1930.

In the above table the numbers show one or two 100-acre clearings.

The cattle and ploughmen for the clearings at Aduku and Ngetta were trained at Ngetta Farm under the supervision of the Agricultural Officer, who also assisted the Administration by marking out the separate plots on each clearing, and in many other ways.

(A) Experimental Work.

(1) All Agricultural Officers have either been in charge of experiment stations or have had funds at their disposal for use in conducting experimental work in their districts. The experiment stations are :—

(2) Serere Experiment Station.—The newly opened Experiment Farm was fully used for the first time in 1930 when experimental work included the cotton breeding plot and variety trial, under the control of the Assistant Cotton Botanist; cotton sowing date and spacing trial, "black-arm experiment," groundnut spacing trial, sim-sim sowing date and seed rate trial, maize spacing trial, rotation experiment, etc., and increase of mass selections of maize, groundnuts and sim-sim, all under the direction of the Senior Agricultural Officer.

The bulk of the work, apart from the cotton selection, has thus been concerned with cultural methods and this will go on until sufficient information has been obtained. As this occurs the tendency will be for such work to give way to the selection and improvement and testing of strains of other economic crops, as well as cotton.

The Seed Farm, on which very little experimental work is now done, was used in its proper function of multiplying strains of cotton, groundnuts, sim-sim and maize.

Its 30 acres of cotton are a link between the small increase plot and the Mulondo segregated area, and its 10 acres of each of the other main crops supply the muruka one-acre increase plots through which good seed is made available to the native.

Two houses for European staff, a lecture room, and quarters for students attending the Agricultural Course were erected during the year.

(3) Ngetta Farm.—This duplicates some of the Serere experiments and performs similar functions in producing good seed for distribution through Lango.

The erection of a permanent office was begun and the building should be completed early in 1931.

(4) Kamuge.—This farm, like Ngetta, is maintained out of Native Administration funds. It is a small experimental farm at an important native headquarters. It regularly carries a cotton variety trial for the Cotton Botanist while the rest of the land is used to demonstrate a rotation of crops.

(5) Bugusege Experimental Plantation.—The work going on at this plantation has been described under "Coffee."

(6) Money was granted from Native Administration funds for experimental work in Teso and Busoga. In the latter district there is no experimental farm but various sites have been examined, one of which is to be opened up in the coming year. A small experimental farm in the vicinity of Mbale has long been desirable but nothing can be done until the question of Kakunguru's land has been settled.

(B) District Experimental Work.

(1) Cotton Experiments.—These include the quarter-acre trial plots already referred to and the Cotton Botanist's variety trials. Cotton spacing trials were conducted at three centres in Busoga by the Agricultural Officer. This had not been done previously in this district and the experiments will be repeated until the correct spacing has been determined. In Usuku, where cotton does not grow to the same size as elsewhere, owing possibly to a pan formation in the soil, an experiment to test the effect of ridging for cotton was laid down at five centres.

(2) Groundnut Experiments.—These were conducted in Usuku, which is an important groundnut area, on similar lines to the Serere experiments, where the soil is not the best for this crop. Information was sought as to the best spacing for the spreading groundnut and whether ridging or line sowing would effect any improvement on the yield, and whether the bunch type of groundnut would yield equally with the spreading groundnut. The latter, which is in general cultivation, takes four weeks longer to mature than the erect or bunch type, so that it cannot be grown before cotton without making the cotton too late. If after further trials in Usuku the bunch groundnut is successful then it will be run up into bulk on the Seed Farm at Serere and distributed through that area.

(3) Sowing Date Strips.—These were continued from the previous year (in Teso district) with the object of finding out what crops can be planted month by month from March until September.

(4) Rotation Plots.—The standard rotation was laid down at all saza headquarters in Lango and at five centres in Teso.

(5) The foregoing account is an outline of the experimental work being done. The experiments are fully described, and the results and conclusions are given in the Annual Report on Serere Experiment Station and experimental work in the Eastern Province, published in Part II of the Departmental Report.

Pests and Diseases.

Small locust swarms were reported from areas bordering on Karamoja during the early part of the year, and in December, when much larger swarms appeared in Lango, Teso, and on Mt. Elgon. In no case was any serious damage done and there were no hoppers. Cotton pests were numerous. For the first time within the writer's experience *Helopeltis bergrothi* is recorded as doing considerable damage. The characteristic stunting of the plant, lesions on the stems, and the pitted appearance of the bolls were all present. *Lygus vosseleri* and aphids did a great deal of damage to the earlier planted cotton, the leaves of which were very much split up. Leaf miner was also present to an extent which had not been seen before. The boll worms of *Earias* spp. and *Chloridea* caused considerable damage to the young bolls, but perhaps no more than

usual. They appear to be favoured by a drought following a spell of wet weather, such as occurred in November. Jassids, *Empoasea fascialis*, though not much in evidence earlier in the year were very prevalent as the season advanced. It cannot be said that a great deal of damage was done to the crop in general but there is no doubt that they are very important in connection with the introduction of new strains of cotton. Several promising cottons were found to be badly attacked by this pest at Serere. The connection between Jassid and the spread of infection with *Pseudomonas malvacearum* does not seem to have been very great this year. As mentioned previously there was angular leaf spot in plenty and some blackarm, but the disease did not make progress enough to affect the crop to any great extent.

General.

Little mention has been made of food crops, but all the staple crops did well. Bulo and sorghum gave very high yields of grain. Sweet potatoes and plantains were to some extent affected by dry weather at the end of the year, but generally speaking the native population was very well supplied with food throughout the year.

Finally, it is a pleasure to record the assistance rendered at all times by Administrative Officers in forwarding the agricultural programme in the Province.

C. E. J. BIGGS,

Acting Senior Agricultural Officer.

ANNUAL REPORT UPON AGRICULTURAL EDUCATION FOR 1930.

Agricultural Education in the Protectorate falls under two headings, the teaching of rural science and nature study in the general school system and the technical training of native assistants, most of whom will later be employed in the Department of Agriculture. The former will be dealt with first.

Rural Science in Elementary Schools.

Uganda is an agricultural country and, as far as can be foreseen, will be so for a long time to come. Consequently the curriculum of the elementary schools of the country has been arranged to include Agriculture and Nature Study as regular school subjects. From the nature of the case the "agriculture" taught is necessarily of the simplest description and mainly consists of the working of a school garden where lessons in manuring, the rotation of crops, simple seed selection and similar subjects are taught practically. From nine to twelve periods a week, according to the class in which the pupil is working, are allotted to this work, and all the children are given one period a week in the theory of the subject. The school garden is also expected to be used as an out-door laboratory for lessons in nature study, to teach the pupils something about the nature of the soil, the life history and life processes of the plant, and where, also, they are taught to observe the habits of the various insects that are found there. More important than a mere knowledge of these things is an interest in them and the underlying aim of this scheme is to give the pupils an interest in their country surroundings and to make them realise that these surroundings afford just as rich a medium for intellectual endeavour as is provided in the classroom or the office.

An initial handicap to work such as this is the fact that this outlook has been very largely lacking in education in this country in the past and that, consequently, there are as yet practically no schoolmasters trained to teach those subjects. Agriculture and Nature Study were introduced as regular subjects in the normal schools when the educational system was reorganised in 1926. After a trial of three years it was realised that, speaking generally, these subjects were not being as well taught as they might be in the normal schools. Those in charge of the schools had generally had no previous training in this work and the attention given to school agriculture tended to be rather spasmodic. A scheme was therefore planned whereby every elementary teacher should attend at one of the chief agricultural experiment stations for a short course as a part of his normal training. Sanction was obtained to engage staff and to erect the necessary buildings at Bukalasa in Buganda, and at Serere in the Eastern Province. At each centre a suitable lecture room capable of accommodating a class of twenty-seven has been erected and equipped and a hostel consisting of sixteen rooms together with the necessary cookhouses, etc. Two Agricultural Officers were appointed for this work, Mr. C. W. L. Fishlock, B.Sc., A.I.C.T.A., arriving in Uganda at the end of November, 1929, and Mr. M. G. de Courcy-Ireland, B.A., in January, 1930.

Bukalasa Agricultural School.

The Bukalasa School was ready for the first session in April and a class of twenty-eight attended for a course lasting twelve weeks. With the exception of those from the Mill Hill Mission, the class consisted of men who had recently passed out from their normal school and who were already teaching.

The following subjects were included in the course:—

General Agriculture,	Elementary Chemistry, and
Elementary Botany.	Entomology.

These subjects were necessarily approached in the very simplest way, the idea being to lead up to the understanding of improved agricultural practices by a knowledge of the facts underlying them.

Attached to the school is a permanent school garden which is worked by the pupils themselves. As far as possible this is made a model of what can reasonably be expected in an ordinary elementary school. In it is carried out the work suggested in the syllabus for practical agriculture in elementary schools. Manuring, including the use of green crops as manures, the growing of crops in rotation, deep cultivation, the prevention of soil erosion, seed selection and the testing out of improved seed are some of the lines of work which are carried out by the pupils. Careful records are kept and before passing out they are required to plan, lay out, arrange the cropping of, and plant up a school garden on an area of bare land that has been set aside for the purpose. A model pen of fowls is kept and lessons are given on foods and feeding, improvement by selection and general care and maintenance.

Use is made of the plantation as a whole for teaching and demonstration and valuable assistance has ungrudgingly been given by the Cotton Botanist and by the Plantation Manager, who have most kindly taken the class on many occasions and explained the work of their various sections. The Coffee Officer also on one of his visits to Bukalasa was good enough to give a lecture on coffee pruning to the class.

There is everything to gain by siting a school such as this at an experimental station like Bukalasa with its unique facilities for demonstration in the field. Far better results can be gained in this way than could ever be hoped for from an agricultural school not so placed; and if, as is anticipated, the need for this kind of teaching outgrows the present facilities, it will be advisable rather to increase the accommodation at Bukalasa and at Serere than to start new isolated centres elsewhere.

Thanks are also due to the Director of Veterinary Services for being kind enough to allow officers of his department to visit Bukalasa and to give two lectures on stock and disease during the session, and to Mr. W. L. S. Mackintosh, M.R.C.V.S., D.V.M., and Mr. H. G. Stewart, M.R.C.V.S. (1st session) and to Mr. J. Carmichael, B.Sc., M.R.C.V.S. (2nd session) for the care and trouble that they took over this work.

A careful examination of the class at the end of the course showed that these teachers had obtained a very fair grasp of and, as far as could be seen, an interest in, rural science. There were no failures, but, of course, the true success of the course can only be measured by the extent to which the lessons learned are put into practice in the schools to which the teachers are drafted. Discipline was exemplary throughout, organised games were played daily, and the proximity of the C.M.S. Mission at Nde'je and the White Fathers' Mission at Nandere kept the pupils in touch with the Missions by whom they had been educated.

The second session at Bukalasa began on September 15th and lasted until December 6th. Twenty-two elementary teachers attended the course. The lesser number was due to the failure of the Mill Hill Mission to send any candidates. Had this been known earlier the vacant places could have been filled many times over. This course proceeded on the same lines as the previous one; all the pupils took full advantage of the opportunities given them and passed out successfully at its conclusion.

The following extracts from Mr. Fishlock's report on the first course may be of interest:—

"Twenty-eight masters attended the course. Many of them had been teaching for several years, but from the keenness displayed by them all it was apparent that they thought the course of great value to them . . . . All the subjects were treated in as simple a manner as possible and especially were they studied from their practical application. The value of the sciences studied to the farmer and cultivator was stressed throughout the course. Every endeavour was made to prevent the masters attending the course from studying the subjects "parrot-wise." To this end the pupils were made to prepare lectures and deliver them themselves. These lectures were given in the pupils' own words and were not repetitions of actual notes given them. Written tests were set weekly and the correction of the papers made use of as a further opportunity to study the grasp of the subjects by the pupils. Final examinations were set at the end of the course.

"The value of the school garden and the conduction of experiments and the keeping of accurate records was stressed. Two school gardens were laid down and run during the course. One was laid down and run on model lines by the officer in charge.

The other school garden was planned, drawn to scale, laid down and planted by the pupils themselves with little or no assistance. Records were kept of the experiments being made, in both cases, by the pupils.

"Since the end of the course several schools have been visited and already the good effects of the course are apparent. This has been the case not only in the schools from which masters have attended the course but in schools which have only heard of the work being done by report. The masters who attended the course were very keen on the work and have, it seems, informed their friends in other schools of what was being done at Bukalasa. School gardens have been laid down in schools and are being intelligently run by masters who have been told about the school garden at Bukalasa."

Serere Agricultural School.

Delay was caused in the opening of this school by the fact that the buildings were not completed until the end of the year. Mr. de Courcy-Ireland started on the very necessary inspection of schools in the Eastern Province early in the year, but, owing to shortage of staff in the Department, he was subsequently employed on district work until he went on leave in September. Arrangements are being made for the first class to start as soon as possible in 1931 after his return from leave.

It will be noticed that these courses are only held twice in the year. It has been found in practice that it is only possible to teach agriculture successfully to a "short course" class during the rainy season. Otherwise too much reliance would have to be placed on indoor instruction, which is not wise in work of this kind. This arrangement has the further advantage of giving time to the officers in charge of the schools to spend the other half of the year on tour, keeping in touch with their past pupils, visiting the schools to which they have gone and helping them with their advice. This "extension work" is thought to be of great importance, if full value is to be got from the money expended on this work.

Inspection of Schools.

The appointment of an officer in December, 1929, to take charge of the teaching of Agriculture and Botany at Makerere College has made it possible for the Superintendent of Agricultural Education to spend a considerable portion of his time during the year in the inspection of agricultural work and nature study in the schools.

Normal Schools.

In addition to the Government normal school at Kampala, where regular lessons in Nature Study were given throughout the year by a trained native assistant of the Agricultural Department, regular visits were paid to the five mission normal schools, *i.e.*, those of the Church Missionary Society at Mukono (Buganda) and Nabumali (Elgon diocese), that of the White Fathers' Mission at Bikira (Buganda) and two belonging to the Mill Hill Mission at Nsambya (Buganda) and Ngora (Eastern Province). Examination, at the end of year, of the pupils leaving these schools showed that some time and attention had been given to agricultural subjects, but in all cases more might have been taught from school garden work; in one or two cases the school gardens were not the models of efficiency that they should be at these institutions.

Elementary Schools.

Rather more than one hundred elementary schools were visited and helped in planning the agricultural work. Many of these were visited more than once. As might be expected, the proficiency of these schools varies enormously and it is rarely that a school possesses a master who is really keen on the school garden and its possibilities. Such do exist, however, and a school such as the C.M.S. elementary school at Kamuge in the Bugwere District shows what can be done in this way.

It is pleasing to note that on revisiting schools that have been previously inspected the results of the previous visit are usually apparent. Efforts are usually made to carry out any suggestions that have been made and when matters have not progressed as well as might have been expected it is usually through lack of knowledge on the part of the schoolmaster. Attendance at the Bukalasa or Serere courses should remedy this. Examination papers in Agriculture and Nature Study were set at the end of the year for all elementary and normal schools.

Middle Schools.

Although agriculture as a subject is not taught in these schools, a few periods a week are given to outdoor work, and, in the case of the upper middle schools, Botany is taken as a subject. Opportunity was taken, when on tour, of visiting many of these schools and advice was given as to school plots, etc.

Examination at the end of the year showed that rather more attention should be given to field work than is done at present. An intelligent interest in nature out-of-doors and a capacity for observation is of more use to boys of this age than botanical knowledge crammed from text books.

Syllabuses.

During the year a three-year syllabus for Agriculture and Nature Study was made out for boys' central schools and the syllabus for these subjects for elementary schools was revised, as were also the suggestions for the school garden.

Makerere College.

A three-year Vocational Course is provided for natives wishing to follow a career in agriculture. Practically all the candidates for entry into Makerere College are boys who have successfully passed through the lower and upper middle schools and who are aiming at employment in the African Civil Service. Hitherto, the brighter boys have tended to choose the medical and teaching professions which, perhaps, have more attraction for some minds than the comparative unknown quantity of a career in agriculture. As the material coming from the lower schools should improve in quality every year with the advance of the general system of education throughout the country, and as progressively better candidates should be attracted to agriculture as the opportunities offering in this work are more widely known, the number in the class have purposely been kept low.

One boy took this subject at Makerere in 1924-26 and was taken into this Department on the completion of his course. Though not brilliant, he has done steady, useful work and is at present employed in the section of the Economic Botanist. Five pupils finished their course at the end of 1929, only one of whom was successful and entered the Native Civil Service on probation to work under the Cotton Botanist. The other four were engaged by the Department at lower rates of pay with the possibility of their being allowed to enter the Civil Service later if their ability and usefulness warranted such a course. Two have been working under the Agricultural Officers in Lango and Ankole respectively, one under the Agricultural (Education) Officer at Bukalasa, and one under the Assistant Cotton Botanist at Serere. Very favourable reports have been received at the end of the year from all the Officers under whom these Native Assistants have been working. The following extract from the report of the Senior Agricultural Officer, Serere, is typical of the opinions expressed:—"I have had two excellent monthly reports from Lango District in the absence of an Agricultul Officer. S———has been touring and reporting on the condition of the crops and his remarks have shown good sense. He has also shown ability in the keeping of meteorological records, management of plot experiments and practical work with implements. I should say that his character is good and his bearing likely to impress chiefs with whom he may have to deal . . . . . The training that S———has received seems to have fitted him very satisfactorily for the duties of assistant to the Agricultural Officer in all branches of his work."

At the end of 1929 Mr. R. W. Stuckey, M.A., B.S.A., A.I.C.T.A., was appointed an Agricultural Officer to take charge of Agricultural and Botanical work at Makerere. The course lasts for three years. During the first year the general education of the pupils is carried on and special attention is given to Elementary Science and Mathematics. In the second year nearly their whole time is occupied with Elementary Science, but, in addition, Mathematics and English are continued. During this year a start is made with Biology. Four periods a week are given to Botany, which is taken in the Agricultural laboratories, and a similar number of periods are given to Zoology (which is taught by a member of the staff of the Medical Department). These classes are attended, in addition, by the medical and veterinary pupils. This combined class during 1930 consisted of five agricultural, six medical and two veterinary students. During this year the agricultural students give three periods a week to agriculture, partly on the plantation and partly in the lecture room.

During the third year the agricultural class spends practically the whole time on agriculture and allied subjects (agricultural botany, agricultural chemistry, entomology and mycology, etc.). The work is divided between the plantation, the laboratory and the lecture room. The third-year class during 1930 consisted of one student only. The pupils during both the last two years have their own experimental plots on the plantation which they cultivate themselves and of which they keep their own records. Excursions were arranged to various plantations during the year, including the Government plantation, Serere, the Government plantation, Bukalasa, the Botanic Gardens, Entebbe, to Mr. Lea Wilson's estate at Namutamba, and to the sugar estate of Mr. Nanji Kalidas Mehta at Lugazi. Thanks are due to the owners of the two latter estates for their kindness in allowing the visits to be made. Mr. Stuckey states that he is of the opinion that such excursions are very instructive to the students and hopes to include a larger list of suitable plantations which are easily accessible from Kampala in next year's third-year course. At the end of the year the third-year student passed out successfully; next year he will work in the laboratories under the Agricultural Chemist.

General.

In conclusion, I should like to acknowledge the constant and courteous help and co-operation of the Honourable the Director of Education and all members of his staff. A close liason between the two departments is essential for the success of this work, and this has at all times been maintained.

Thanks are also due to all those members of the Agricultural Department who have been kind enough to help in various ways.

E. G. STAPLES,

Superintendent, Agricultural Education.

REPORT OF THE TOBACCO OFFICER.

I returned from leave on the 26th February and was stationed in Bunyoro until the end of the year.

Mr. Hazel, who had been in charge of the work in the district during my absence, was transferred to Serere in June.

Owing to the time taken up with field work in the close supervision of the native crop, it has not been possible to undertake any experimental work on tobacco during the year, and work on the small plantation at Bulindi has been confined solely to seed selection.

Samples of air-cured "White Burley" and "Amotilla" varieties from the second crop of 1929, grown at Bulindi, were submitted to brokers in London and Liverpool, and their reports indicate that these types are acceptable on the home markets, and further trials with these types will be carried out in other localities during the coming year.

The crop continues to be fairly free from insect pests; cutworms, crickets, and grasshoppers causing the chief trouble.

Cutworms are a serious pest both on new and old land and are responsible for very heavy losses in the newly-planted fields.

"Mosaic" and "Frenching" have been responsible for some loss, and the "Frog-eye" spot, caused by *Cercospora nicotiana*, has been prevalent on tobacco in some of the damper areas in Kyagwe, but, generally speaking, the crop has been remarkably free from disease.

Increasing interest is being taken in the crop by European planters, and up to the end of September (the latest record available at the time of writing), 92,629 lbs. of fire-cured leaf had been exported compared with 61,967 lbs. for the whole of 1929.

Brokers report that the standard of grading of recent shipments has not come up to that of earlier consignments, and manfacturers have complained of the mixed nature of the leaf in the bales.

It is increasingly essential that more attention should be paid both to grading and packing, as now that it is fairly well established that Uganda tobacco is proving of interest to manufactures, they will look for the same quality of handling as they are obtaining with other Empire leaf.

With regard to these points, the following extracts from reports received from well-known brokers in London and Liverpool are of interest.

One firm of brokers states:—

> "We are interested in Uganda tobacco and have dealt with some lots which were shipped to London but, unfortunately, while the tobacco itself was of excellent quality, it was packed in much too moist condition."
>
> "We were able to obtain 1/6 per lb. for the first lot in spite of its moist condition but later shipments arrived in even worse condition and had developed a rather unpleasant flavour and some mould, so we could not continue to deal with this tobacco."

The following extracts are taken from a report received from another firm:—

> "The largest user of this class of tobacco on our approaching him to take a second lot of Uganda tobacco, informed us that the tobacco had failed to come up to expectations, as the contents of the bales were much too irregular, long and short leaves being tied together, textures very mixed, also varied in colour throughout, and the moisture content extreme. One admission, however, was made, and that was to the effect that the flavour was undoubtedly superior to other Colonial tobaccos, though somewhat strong."

In describing some manufacturing tests carried out to ascertain comparisons between Uganda leaf and certain other Colonial leaf, the same firm states:—

> "The difference in moisture would be partially offset by the better spread obtained by the use of Uganda wrapper."

It is evident, from these reports, that Uganda can produce good fire-cured leaf for which a ready market can be found if the leaf is properly handled.

Planters, encouraged by the ready sales and good prices received for their earlier small shipments, are now inclined to plant larger acreages than they can properly handle.

Tobacco, after it has been grown and cured, requires a good deal of house-room for bulking, grading and packing, and it is owing to lack of space when handling the cured leaf that a good deal of the trouble experienced with grading can be traced.

The question of packing in cases in preference to bales has been brought up by brokers who state that leaf packed in cases will prove more attractive to buyers.

Cases are expensive in Uganda, but the requirements of the market must be studied and if leaf packed in cases realises ½d. per lb. more than baled leaf, the cost of imported cases will be more than covered.

It has been suggested that suitable cases could be made locally from "Musisi" or "Musoga" timber, and it is hoped that some trial shipments in locally made cases will be made in the near future.

The lower grades of leaf have continued difficult to dispose of during the year and in many cases have sold only at rates which do not cover costs.

The value of a crop, however, is in the average price obtained, and where reasonable efforts have been made to ensure success, the amount of lower grade leaf produced has not been excessive.

"Blue Pryor" continues to be the most popular variety for the production of fire-cured leaf for the home market.

This variety gives a large leaf of good texture and cures out well.

Steady progress has been made with the development of tobacco growing by the natives in Bunyoro and the April—July crop amounted to nearly 113,000 lbs., the whole of which was taken by the British-American Tobacco Co. for their factory at Jinja.

The growing and curing of tobacco calls for a good deal of attention and work, and it is surprising to find the crop so popular with the Banyoro, who take little interest in agriculture generally.

The average yield per acre was approximately 560 lbs.

The crop was of excellent quality, and showed a marked improvement over previous crops both in quality and the general manner of handling and preparing for market.

The second crop, planted in September, suffered severely from adverse weather conditions at planting time.

Conditions were particularly difficult around Hoima, and of an estimated area of 200 acres planted only some 90 acres survived.

The crop proved to be much heavier than was to be expected, the total crop amounted to 70,093 pounds, consisting of 47,686 pounds of No. 1 Grade and 22,407 pounds of No. 2 Grade. The crop was of unusually high quality, a high proportion of the No. 2 Grade being only just below No. 1 standard.

The purchase of the second crop of 1929, which was marketed in February, and the early crop of 1930, marketed in September, resulted in the distribution of £2,160 amongst the growers in Bunyoro.

The value of the crop to the district, however, cannot be entirely gauged by the monetary value.

It is of undoubted value in that it tends to keep the men regularly and profitably employed, calls for a certain amount of intelligence, and is definitely of educational value in interesting the natives in agriculture.

Fears have been expressed that the encouragement of tobacco growing would lead to a falling off of cotton planting in the district.

These fears are entirely unfounded and some of the best cotton is to be found in the areas where tobacco is grown, as all growers are encouraged to plant up their old tobacco plots with cotton in July as soon as the tobacco is off.

This leads to the cotton being planted in good time as the land requires very little preparation after the tobacco crop is taken off.

The usual practice at present is for new land to be opened for tobacco in September. This crop comes off in December and another crop of tobacco is planted in the same land in April. This crop is harvested about the end of June and the land is then planted with cotton. "Bulo" or "sim-sim" follows the cotton and the land then generally goes down to sweet potatoes.

Up to the present the local factory has absorbed the whole of the tobacco grown by natives in Bunyoro, but it has been realised that if the industry has to depend entirely on the local market it will be liable to certain fluctuations owing to the relatively limited demand, and in order to avoid the undesirable position which might at any time arise owing to the local market not being able to take the whole or part of any crop, and the growers consequently being left with a certain amount on their hands, certain buildings have been erected at Masindi to serve as a packing station, with a view to being in readiness to deal with such a situation, should it arise, by exporting any surplus.

This arrangement not only safeguards the native cultivators, but by encouraging continued planting, will ensure regular supplies of leaf for the local market.

Tobacco planting by natives is being encouraged on a small scale in certain parts of Kyagwe, where European planters are distributing plants to natives living near their estates and are purchasing the crop.

G. T. PHILPOTT,
Tobacco Officer.

ANNUAL REPORT OF THE COFFEE OFFICER.

Planting.

In my Annual Report for 1926, para. 2, is the following:—

> "Not enough care has been exercised in the past in the preparation of holes for planting out the coffee seedlings from the nurseries, with the result that many of the trees show poor growth and considerable die-back due to the damage done to the roots of the seedling when planted out in the fields. It is imperative that all the roots of the young plants be set in the soil in a natural manner and especially that the tap root be not broken or twisted."

In the Toro district much die-back has occurred and I wish particularly to draw attention to the above paragraph. On some shambas planted in 1928 planters have gone from one extreme to the other and plants have not been planted deep enough, probably because the plants were too small for planting out in the fields.

Cultivation.

This has improved during the last year, but there is room for still greater improvements. In most cases a system of deep digging is done which turns the weeds on the side and enables them to continue growing. The weeds should be knocked out of the soil and placed on top to act as a mulch, new seeds will germinate and the soil will always be covered. This method should be cheaper for the planter as the ground will not need weeding so often as at present with the so-called deep digging. If the weeds are placed in lines across the slope they will help to prevent wash.

Mulching.

On a few shambas attempts have been made at mulching. This is found to be very expensive but there is no doubt that the return would justify the expenditure. Where mulching has been done over a small area healthy trees are to be found with a very good growth and heavy crop. It is easy to compare these trees with others on an area that has not been mulched; the difference is remarkable, and indicates the value of mulching.

Pruning.

On most estates the single stem method of pruning is adhered to; there are other estates that have no real method of pruning. The trees are certainly pruned and a mixture of single, Agobiado and multiple stem systems is the result. This cannot be satisfactory as the trees get out of hand very easily and it is very difficult to cope with insect pests.

Pruning on the single stem method should not be difficult if the planters spend more time in the fields with the pruners. This is very necessary. West Nile porters prove to be very intelligent once shewn what to do; these men on an average prune 50 trees daily.

Die-back of Coffee in the Toro District.

This is serious on all estates on the Ntoroko Road, which were all cleared and planted in April and May of 1928.

The young plants were very healthy and shewed rapid growth. They outgrew their strength and bore a very heavy crop for the first and only time, and later the trees shewed signs of die-back and could not stand the strain of the crop. I repeatedly advised the planters to relieve the trees by stripping part of the crop commencing at the end of the primaries and stripping four to six inches towards the centre of the tree, but this was not done in such a thorough manner as could be desired.

On visiting the shambas a second time I found die-back much worse and Hemelia leaf disease very rampant. The trees were almost defoliated and immediate stripping of the entire crop to save the trees was strongly urged.

This, however, was not done until the trees were past the stage of recovery, and trees carrying a heavy crop died out in large numbers. Some planters have an idea that climatic conditions are responsible for such a state of affairs. Climatic conditions may have had some effect on the ripening up of the crop, but these conditions were not directly responsible for the death of the trees.

The reasons for so much die-back are :—

(1) Bad planting.
(2) Lack of proper cultivation when the trees were young.
(3) Overcropping.
(4) Hemelia Leaf Disease.
(5) Hailstorms.
(6) Not stripping the crop in time to save the trees.

Most of the coffee planted in 1928 was Bourbon. This type of coffee bears heavily when young and cannot stand the strain of the crop. Nyassa coffee is a much hardier type and does not suffer from Hemelia leaf disease as badly as Bourbon. In fields where both types of coffee were planted I noticed that Hemelia attacked the Bourbon type whilst the Nyassa was practically free and was not defoliated as much as the other.

It is advisable for planters to get the best seed from the Nyassa type, and this can be obtained from coffee grown in the Bugishu district. This coffee is very healthy and is much more suitable for planting in Toro district than is Bourbon.

Manufacture of Coffee in Toro.

(1) *Pulping.*—Most of the pulpers are neglected and so often turn out indifferent work, and moreover the pulpers are placed in such a position as to cause great inconvenience while working. If a little more attention was paid to the machines, such as drying and oiling after use and positions altered in some cases, to make working easier, the crop could be more quickly and efficiently handled.

(2) *Washing and Drying.*—The fact that this step in the manufacture of the crop requires care is often overlooked or ignored and consequently the coffee is spoilt after entering the factories. Some is over-fermented, insufficiently washed and under-dried. The present method of quick drying and sending small consignments of coffee to be put on the market leaves much to be desired. All coffee should be half dried and then stored for several months to preserve the oils and colour. When most of the crop has been gathered and treated in this way further drying will be necessary before shipment. This method makes the coffee more attractive inasmuch as the quality will not have deteriorated.

Factories.

There are few factories that are kept in good condition as to cleanliness, in the majority of cases machinery is left dirty and allowed to rust. With very little trouble, things could be greatly improved. Most factories are not under lock and key and coffee can easily be stolen. Far too many men are employed in the factories, which could be run on more economical lines.

Miscellaneous.

Some planters had an idea of topping young coffee trees at a height of 2ft. 6ins. to strengthen the lower part of the trees. This, however, only induced further growth of primaries, secondaries, and tertiaries. The crop was not only borne on primaries as should have been the case, had the trees not been topped at this stage, but all secondaries and tertiaries were bearing at the same time. Thus the trees could not carry all the crop and they weakened, and die-back set in.

Quite a large area of coffee has been abandoned and *Lumbugu* has crept in at an appalling rate. These abandoned areas are breeding grounds for *Antestia*.

W. L. MUNN,
Coffee Officer.

THE BOTANIC GARDENS, ENTEBBE.

These Gardens were commenced by Alexander Whyte, M.A., F.L.S., who in 1898 was appointed Curator of the Botanic Gardens, Uganda, "about to be established for the better examination and development of the Agricultural Resources of the Protectorate." They are situated at Entebbe, on the edge of Lake Victoria, in what were once natural forest lands fringing the lake. Many of the original forest trees have been left to form isolated specimens in the grounds, while in one or two places the forest has been left almost in its original state, except for the provision of paths and the addition of a few suitable shade-loving plants, as in the area known as the fernery, which forms one of the most natural and attractive features of the Gardens.

2. The situation is an ideal one for a Botanic Garden, as the higher lands overlook the Lake and from many parts of the grounds excellent views are to be obtained between the trees of wide stretches of water, dotted here and there with small islands, which on sunny days suggests the deep blue of the Mediterranean. From these high lands the ground falls steeply down towards the lake. The slopes are covered with grass lawns which are kept well mown and are dotted here and there with specimens of indigenous and exotic trees. The soil in this part is a rather poor clay type, but nearer the lake, where the land is gently sloping to almost flat, good loamy soils are met with, though even here the soil is rather heavy. "White-ants" are troublesome in many parts of the Gardens and have been the cause of losing many exotic plants and trees.

3. In addition to the area comprised of lawns and specimen trees, with flower beds and borders scattered irregularly at suitable intervals, there are plots of economic crops, including Hevea rubber, cocoa, oil palms, *Hydnocarpus*, and fruit trees. There is also a large nursery for the propagation of plants for distribution as well as for the raising of introduced species. Good roads and paths are provided which pass through the most interesting portions of the grounds. Some of these are large enough for light motor traffic, which enables the Gardens to be visited even in the hottest part of the day.

4. *First Curators and Assistants.*—In addition to Mr. Whyte, who in 1902 was transferred to British East Africa (Kenya), the Officers most closely associated with the establishment of the Gardens were Mr. John Mahon, who was appointed an Assistant in 1901; Mr. M. T. Dawe, appointed the following year; and Mr. E. Brown appointed in 1903. In that year, Mr. Mahon was invalided home and the Gardens were in charge of Messrs. Dawe and Brown until the resignation of the latter at the end of 1907, when Mr. Fyffe was appointed an Assistant in his place.

5. *Early Work.*—During these early years experiments were carried out with a large number of economic crops in order to test their suitability for extended cultivation. The Gardens were responsible for the first introduction of, or early experiments with, all the chief tropical agricultural crops, including cotton, coffee, cocoa, sisal, Mauritius hemp, Hevea, Ceara, Castilloa, and Funtumia rubbers (though this latter was afterwards found to be indigenous), besides many economic plants and fruits, including the best kinds of Indian mangoes from Bombay and roots of the best varieties of bananas suitable for dessert. In addition many ornamental trees, shrubs, and herbaceous plants were introduced. All these plants were propagated as quickly as possible and all desirable kinds distributed in various parts of the Protectorate, where many are still to be found in some of the older Government stations. It may be of interest to place on record a few notes on some of the more important agricultural crops.

6. *Cocoa.*—The first plants were introduced from Kew, arriving in August, 1901, and being planted out in December of the same year. Three more cases of plants were received from Kew in September, 1903. In 1906-7 we find that the seed from the earliest introduced plants was being used for planting and distribution except for a small quantity sent home for report. A further five acres were planted in the Gardens the same year and two acres in a native garden in Entebbe. In 1908-9 a consignment of seedlings was received from the West Indies. In the same year the plantation at Kampala was opened, twenty acres being planted with cocoa.

7. *Hevea Rubber.*—The first tree was introduced from Kew in 1901, and a case of plants from the same place in 1903. At five-and-a-half years the first tree was 30 feet high and 17½ inches in girth at three feet from the ground, the increase in girth during the year being four inches. This tree was tapped in 1908-9 when seven-and-a-half years old and 30 inches in girth at three feet. The first plot was planted in 1904 and in 1909-10 these trees were tapped and tapping was more or less continual from that date onwards. Many seeds and plants were distributed during this period and additional seed was also imported for various Uganda plantations.

8. *Other Rubbers.*—A case of Castilloa and one of Funtumia rubber seedlings was received from Kew in 1903. Seeds of these and also of Ceara were obtained and seedlings from them planted. Funtumia rubber was later found to be indigenous. Experiments and better knowledge revealed that all these rubbers were of less importance than Hevea and their cultivation was abandoned.

9. *Cotton.*—Experiments with this crop were carried out from the commencement of the Gardens. In 1904-5 we find that American Upland was doing better than the Egyptian varieties Affifi, Ashmouni, and Abassi, and was valued at several points higher than middling fair American. By 1906-7 cotton cultivation was already taken up by the natives and a large ginning factory was in operation in Kampala. It is interesting to note that three kinds of Caravonica cottons, obtained from Dr. Thomatis of Queensland, were tried in the Gardens about this time but samples ginned from the resulting cotton showed the percentage of lint to be only 30% to 31%, which was less than the American Upland at that time, whereas Caravonica was reputed to give a very high percentage of lint.

10. *Coffee.*—A tree of *Coffea robusta* was introduced from Kew about 1900 and yielded 17oz. of parchment coffee in 1903-4. In the same year a plot of *Coffea arabica* var. *Nyasaland*, nearly two acres in extent, is recorded as yielding a good crop, the seed from which was being distributed. During this year Blue Mountain and Guatemala varieties of *Coffea arabica* were introduced. At this period a lot of Nyasaland plants were distributed among chiefs and missions, both on the mainland and also on the Sese Islands. In 1904-5 plantations of the Nyasaland variety were established at Kakumiro and Masaka. The same year a tree of Maragogipe (*Arabica*) established in the Gardens gave a first crop of 2 lb. 3½ oz. parchment coffee, a small plantation was made of Guatemala and Blue Mountain varieties of *Coffea arabica*, and of a Congo variety of *Coffea robusta*. Some native *Coffea robusta* in the Gardens was attacked by a berry boring beetle during this year. From now onwards coffee cultivation by natives and by the missions was extending rapidly and it is recorded that coffee pulpers were installed at the plantations at Masaka, Kakumiro and on the Sese Islands.

11. *Tea.*—The first plants were introduced in 1900. Further plants and seeds were obtained in 1903, a plantation being made in the Gardens and a small trial plot in Sese. This latter proved a failure but plantations at Masaka and Kakumiro did well. During 1906-7 636 plants were distributed. A large consignment of seed from Assam was planted at Kampala in December, 1909.

12. *Miscellaneous Fibres.*—In 1903-4 several thousand bulbils were introduced and extensive plantations laid down of Mauritius hemp (*Furcraea giganiea*, Vent.). In 1906-7 experiments gave a yield of 74½ tons of leaves per acre at one cutting, but hand preparation of the leaves was found to be slow and expensive. A few plants of sisal hemp (*Agave sisalana* Perrine) were introduced in 1903 and made rapid growth. In an experiment in 1908-9 sisal leaves gave 3·55% of dry fibre compared with 1·03% from leaves of Mauritius hemp (both hand prepared). The sisal was estimated to be worth £27 to £28 per ton with best Mexican at £25 per ton.

13. *Lemon Grass* (*Cymbopogon citratus*, Stapf).—This was introduced at an early date and by March 31st, 1907, some 50 acres had been planted up near the lake, largely to replace bush in areas previously infected with the tsetse fly. A still was introduced in 1908 and distillation commenced on the 10th August. In 1909-10 some 17,823 ounces of oil were exported and sold at from Shs. 2/3 to Shs. 2/8 per ounce in London.

14. *Separation of Agricultural Work.*—As the agricultural possibilities of the country became more manifest steps were taken to appoint officers for special work. A Tobacco Officer (Mr. J. van Leenhoff) arrived in Entebbe at the end of December, 1907; a Cotton Inspector (Mr. A. R. Morgan) in April, 1908; an Entomologist (Mr. C. C. Gowdey) in February, 1909; and Superintendents of Cotton Cultivation in 1909, after first visiting America (Mr. P. H. Lamb), Egypt and Ceylon (Messrs. E. T. Bruce and L. E. Knollys) to aquire useful knowledge of tropical crops before coming to Uganda. A Veterinary Officer (Mr. E. Hutchins) also arrived and in addition a number of local appointments were made. By the commencement of the year ending 31st March, 1910, the botanical and forestry work was definitely separated from that of agricultural work, though experiments with some agricultural crops were still continued in the Botanic Gardens.

15. *Progress after Separation.*—With the opening of experiment stations elsewhere it was possible to reduce the area of the Gardens to a size commensurate with its new status, but experiments with Hevea rubber and cocoa were still carried out, on account of the oldest trees in the country being established there. Various improvements were effected in the lay-out of the grounds, including the laying out of lawns, making of suitable roads, flower beds, borders, etc., while the work of introducing, establishing and distributing economic and decorative plants continued. The outbreak of the Great War in 1914, resulting in a much depleted staff, naturally had an adverse influence on the Gardens and considerably retarded progress.

16. *Resumption of Control by Agricultural Department.*—From time to time during the latter part of the above period the question was raised of the Agricultural Department assuming control of the Gardens, especially of the economic section with the Hevea rubber and cocoa, particularly by the planting interests concerned. Eventually this course was decided upon and the greater part of the Gardens, together with the meteorological work, was taken over on April 1st, 1917. A small portion was still retained by the Forestry Department for nurseries and experimental plantations.

17. *Later Extensions.*—At the commencement of 1921, the Victoria Hotel grounds were taken over, as the new Secretariat buildings and Legislative Council Chamber were to be built on the site of the hotel. Many of the original bush and forest trees were cut out (leaving only the best specimens), various parts of the grounds were levelled, lawns and suitable flower beds and borders were made. In January, 1927, when this work had been completed, this area was taken over and has since been kept up by the Secretariat Department. In October, 1927, a plot containing 260 oil palm trees was taken over from the Forestry Department. In June of the same year a small area was planted up with *Hydnocarpus*, and in 1929 some budded citrus trees were planted adjoining them.

18. *Progress under Agricultural Department.*—Experiments were continued with Hevea rubber and cocoa, and later with oil palms, with a view to obtaining information as to individual yields and the selection and propagation of the best. The work of introducing and establishing useful economic and decorative plants was also maintained. The lawns and flower beds were improved and a rose garden laid out and planted. The distribution of seeds and plants throughout the Protectorate continued to form an important part of the routine work.

19. *Conclusion.*—In the foregoing I have endeavoured to set forth something of the origin and early work of the Gardens and to mention some of those who supervised it. It has taken thirty years to get together the present collection of plants. A reference to Mr. Dawe's list, printed in 1904, and to subsequent manuscript lists will show how large and varied this collection is. A well-kept and fully stocked Botanic Garden is a national asset. It is also an indication of the agricultural possibilities of a country. It should be the aim of those responsible for its up-keep to see that it is kept at the highest possible standard consistent with the prosperity of the country.

J. D. SNOWDEN,
Economic Botanist.

APPENDIX No. 2

A SHORT ACCOUNT OF THE HISTORY AND DEVELOPMENT OF COTTON IN UGANDA.

By G. W. Nye, Cotton Botanist.

The object of this paper is to place on record a short account of the development of cotton as an industry in Uganda. Information is scanty and difficult to obtain and the writer apologises for the numerous errors and omissions which unavoidably exist in an account which does not pretend to be more than a short summary of the subject.

The actual origin of cotton in Uganda is shrouded in the mists of antiquity, and it is very difficult to find any reference to wild or indigenous cotton plants except in one or two isolated cases. In 1862 Speke and Grant reported that *G. barbadense* was to be found in Uganda, but no mention is made as to whether the plants grew wild or were cultivated. In 1872 Samuel Baker coming from Egypt *via* the Nile brought with him some seed of "Gallini" cotton which he established near Masindi in Bunyoro. In 1880 Emin Pasha, writing of the Equatorial Province (which included part of Bunyoro, all Gulu, and what is now the West Nile District) stated: "A kind of cotton also occurs in some localities; for instance, in the country of the Bari a Gossypium is found, the ripe grains of which are green, but the cotton has long and fine fibres. Some Danagla living here, and who are skilled in weaving, made a loom, and now many people are earning their bread by making so-called damur, a home-made cotton material which is very well suited for our climate." In 1886 he writes from Wadelai: "I send you a sample of the beautiful pocket handkerchiefs we have made from cotton that we planted and spun ourselves." In 1893 Lugard reports "a wild cotton grows throughout Uganda." Apart from these few references no further information is available and that obtained from natives is equally vague.

So-called wild cottons were reported in the early stages of the cotton industry from nearly every district, but it is doubtful whether any of them were really indigenous. Certainly no native spinning industry has existed except in one or two cases in a small way—the existence of bark-cloth rendered it unnecessary to find any other plant for making clothes.

So-called Wild Cottons.—There is a cotton in Buganda called by the natives "Segamwenge" which means that a man could not pass it when under the influence of liquor. Specimens of this have recently been obtained and were grown at Bukalasa last season. It is a tree cotton of the *Gossypium brasiliense* type—it did not grow very well at Bukalasa as it became very heavily infected with black-arm. This cotton is generally known of by natives, but very few appear to have seen it before and no information can be obtained as to whether it was ever used by them. Reports state that Arabs used it in King Mutesa's time for making pillows. It seems very unlikely that this cotton is really indigenous and it is probable that it was introduced by Arabs or other traders from Egypt or the Sudan, and may, in fact, be similar to the "Jumel" cotton in Egypt and the "Nyam-Nyam" cotton in the Sudan. The *G. barbadense* reported by Speke and Grant was undoubtedly this cotton.

In Busoga there is a "wild" cotton called by the natives "Bufumese." No specimens are available, but from all accounts it is similar to Segamwenge and was used in a small way for making caps, belts and socks.

While on a safari in Lango in 1910, Mr. Lamb, Director of Agriculture, reported having come across specimens of *G. obtusifolium* var. *Africana* and *G. brasiliense* on the northern shores of Lake Kwania—he reported that the former had been cultivated since ancient times but had then been replaced by *brasiliense* on account of its superior staple. The natives said that *brasiliense* had been introduced into Lango and Buruli within living memory, probably from Bunyoro. The Lango women used the cotton for making their frontal frills, the plants being grown as one or two shrubs outside the houses.

The Galline cotton introduced by Baker, together with cotton reputed to have been introduced by the Arabs many years previously (probably Segamwenge) was used in Chua for spinning—the process being to gin the cotton by hand and then to place the lint in a calabash, at the bottom of which there was a small hole; through this hole the cotton was drawn out and rubbed against the thigh with the fingers making a sort of thread. The thread produced was knitted into small hats with needles made from bamboo.

There is also a wild cotton reported from the Western Province called "Ewaru" which seems to have been introduced by the Sudanese in Kabarega's time.

Cotton as a Commercial Crop.

Prior to 1903, apart from small trials made by the missions, no use of cotton as an economic crop appears to have been made and such cottons as were existant in the country were obviously unsuited for export. In 1903 the Government imported half-a-ton of seed of each of the following varieties from Egypt: Abassi, Affifi and Ashmouni. This seed was distributed to natives in accessible parts of the country for trial in April and May, 1904. At the same time the Uganda Company imported half-a-ton of the following types: American Upland, Affifi, Peruvian Sea Island, Black Peruvian, and Yannovitch. Seed of this was distributed in the following counties:—Bulemezi, Buruli, Kyadondo, Singo, Gomba, Kyagwe, Busiro, and Bwekula. Of these Uganda Company importations only American Upland (var. unknown) was successful, all the others being a complete failure. By this time considerable interest in cotton was evinced by the natives, this leading the Government to import an extra ton of each of the three Egyptian varieties mentioned above. These arrived late in 1904 and in the following season were distributed to interested natives in Buganda, Bunyoro, and Busoga. Ashmouni and Affifi were complete failures, but Abassi showed considerable promise.

The results of the Uganda Company's trials with American Upland were so promising that the Government obtained through the British Cotton Growing Association a ton of American Black Rattler seed which was distributed to growers in Buganda, Bunyoro, Busoga and Ankole in 1905. At the same time, owing to the fact that Abassi was the more valuable cotton, further trial with this cotton was considered advisable. Five tons were accordingly imported in August, 1905, but owing to the success of Black Rattler only one-and-a-quarter tons of Abassi were distributed.

The next importation took place in December, 1905, when strangely enough more Abassi was imported "owing to certain representations made in favour of Abassi." The seed was grown in a small plot at Entebbe and proved a complete failure. The result of this last failure of Abassi was a definite decision that American Upland varieties were the only ones likely to produce an economic crop. Following this decision a further ton of American Upland (var. unknown) was imported in April, 1907.

In addition to distribution by the Government, a considerable amount of seed was distributed by the Uganda Company at the same time. The result of this must have been an enormous mixture of varieties the descendants of which are probably still in existence in Buganda. At this time all the seed was picked over by hand before distribution with the object of removing all naked seed and thereby getting rid of the Egyptian varieties.

Prior to 1907, the Uganda Company was the sole buyer in the Protectorate, but in 1907 buying was still uncontrolled and the crop being attractive, a number of native and Indian buyers entered the field, the result being that there was great competition for the crop and cotton of any sort was readily purchased. The price this year was Rs. 6/8 per 100 lbs. There were of course no fixed buying posts at this time and the buyers wandered from plot to plot setting up their scales on the plot itself and buying anything that was offered to them; the consequence was that a very high percentage of the crop was picked before it was mature and no attempt was made to separate the cotton out into various grades. Several cases occurred at this time of growers picking the bolls green and drying them in the sun outside their houses until they opened. It was not surprising that even at this early stage serious complaints were received from home as to the quality of the crop.

A conference of those interested in the formation of a sound cotton industry was called by the Government in 1907. At this it was decided that only American Upland seed should be imported and that owing to the grave danger of an admixture of numerous varieties some control in the distribution of seed was necessary. Measures were then taken to eradicate all undesirable types and to supply only one variety, the seed to be obtained from numerous Government seed farms then established at various centres.

In 1908, 35 tons of Black Rattler seed were distributed and only between 5% to 10% of the plants were other than Upland. Special planting instructions were issued by the Government, the main points being spacing between the rows from 3 ft. to 5 ft. and between the plants from 1½ ft. to 2½ ft., four seeds to be sown per hole and the holes to be dug a week previous to sowing. The instructions also stated that seed should be soaked in water twelve hours previous to planting and that the plants should be hilled when 6 to 8 inches high and again when 16 inches high.

The only ginnery in existence at this time was one belonging to the Uganda Company in Kampala. This meant that considerable distances had to be travelled with head loads and in order to relieve the native of some of the burden of these loads the Government constructed in Entebbe a number of small wooden hand gins similar to the Churka gin used in India at the present time. These were sold at Rs. 15/- each but they apparently proved unsatisfactory, probably owing to the extraordinarily uneven lint that must have been produced. They were all withdrawn and the owners compensated.

By 1908 the crop had spread considerably in Buganda and Busoga. Even at this time reports comparing Kampala and Busoga reported the latter to be more soft and wasty than the former and to be worth ¼d. per lb. less.

Several seed farms were now in existence, including one run by the Kangao at Bowa to supply seed in that area.

In 1909, 82 tons of seed were distributed, consisting of Black Rattler and "Ordinary Uganda" seed. This was all picked over by hand before distribution, all naked seeds being rejected. At this stage only 1% of the crop showed Egyptian characters.

It is interesting to note that in 1910 the average size of a cotton plot was 25 yards by 14 yards, which was reported as being nearly eight times the size of those of the previous year.

In 1909 several new varieties were being tried, and the following yields were obtained at a Government seed farm at Namenge in Busoga:—

	Lbs. per acre.
Local cotton (probably Black Rattler)	555
"Naked Seeded Uganda"	66
Sunflower	516
Allen	258
Griffen	320
Abassi	complete failure.

It is curious to note that despite the Government decision to grow Upland cotton only, Abassi was still being tried and the 1910-11 season quite a fair acreage was planted up with Abassi at Bululu, in Lango, but this is the last time that it appears. Other than this Abassi, only Sunflower and Allen existed as well as a small acreage still under Black Rattler in Buganda. The distribution of the crop at this stage of development is interesting. In the 1910-11 season the acreage figures were as follows:—

	Acres.
Buganda	21,818
Busoga	8,828
Kumi	4,500
Mbale	1,071
Lango	574
Bunyoro	1,988
Ankole and Toro	2,914

In June, 1910, a small plot of Caravonica was planted at Nimule. It yielded at the rate of 560 lbs. per acre and gave cotton with a staple of 1⅛ inches. No further trial appears to have been made with this variety.

In the 1911-12 season the first true cotton experiment station was opened at Kadunguru where work proceeded for a few years until 1916, when Simsa, near Soroti, was chosen as being a better site. The yields per acre in Teso for this season were as follow :—

	Lbs. per acre.
Kumi	480
Soroti	310
Usuku	256
Serere	617

In 1911 Sunflower seed was obtained from East Africa, where it had been grown in the previous season. This was sown together with all the available seed of Allen in segregated areas in Bukedi; both varieties gave high yields and samples sent home for brokers' reports gave 350 points on for Allen and 250 for Sunflower. From this season onwards to the present time a spacing of 4 by 1½ was advocated with planting not later than July in the Eastern Province.

By the 1913-14 season the acreage in the Eastern Province had reached over 83,000 while that in Buganda had remained almost stationary at 25,000. This season the whole of the Eastern Province was under Allen except for a segregated area of 6,000 acres in Teso planted with the new Sunflower. In the following season it was decided to replace Allen with Sunflower and in 1916-17 for the first time the whole Protectorate was planted with seed derived from a local selection—in this case a selection from Sunflower grown at Kadunguru. During this period the spread of the industry was affected by war conditions and the consequent shortage of staff—that the war effect was not greater than it was reflects great credit on the labours of the few who were left behind to carry on.

In 1915-16 the first Nyasaland Upland cotton was imported and grown at Kadunguru; the origin of this variety is stated to be as follows:—"The Nyasaland cotton supplied to Uganda in 1915 was obtained by a line selection from a mixed crop of long stapled uplands in which the variety 'Floradora' predominated. The bulk crops from which the selection was made had undoubtedly had an opportunity of being contaminated with Sunflower, Griffen and other varieties."

The year 1918-19 saw the industry established on a sound footing with an acreage of 145,000 acres and 42 ginneries in operation; this season was a definite landmark as new Cotton Rules were issued providing for a system of licensed buying posts with continuous buying instead of the markets with fixed buying days which were previously in existence. This same season a cotton tax was imposed for the first time, it then being a tax of 4 rupee cents per pound of lint on all cotton produced from seed sown in 1918. The money obtained from this tax was definitely to be earmarked for the development of the cotton industry and included the opening and maintenance of two cotton selection stations, one for Buganda Province and one for the Eastern Province, *i.e.*, at Bukalasa and Serere. Cotton selection work began at Serere as soon as the buildings were erected and the land cleared but, although the plantation at Bukalasa has been established since 1922, no change of seed has been made in Buganda since 1916, when Sunflower was distributed. Even then the older types were not completely eradicated with the consequence that to-day the Buganda crop consists of an amazing mixture of plant types actually varying from completely red plants to plants devoid of any red pigment or variegated, from plants giving practically no lint per seed to those with a ginning out-turn of nearly 40%, and so on. The result of this, however, is that a wonderful field for selection purposes is available and although it will undoubtedly take a considerable time to fix any desirable type there is no doubt that it will be possible to improve on the yield and uniformity of the existing mixture.

1919-20 saw a great rise in prices as an aftermath of war, actual sales taking place in Liverpool at 59·15d. per lb. The consequence of this was that the growers became enriched in the space of a season and the crop became very attractive as a means of purchasing clothes, bicycles and so forth.

Next season produced an increase of 50,000 acres but unfortunately the pendulum of prices swung in the opposite direction, the Government price in the Eastern Province being Fls. 3 per 100 lb. Even at these low prices buyers would not or could not buy with the result that to avoid total loss of the crop the Government had to buy in certain areas. The total purchase by the Government only amounted to just under 4,000 bales, but this intervention had the effect of giving confidence to the growers.

The low prices of the previous season were reflected in the acreage of the 1921-22 season which dropped to the 1919-20 level. After this setback, however, the acreage increased rapidly, reaching practically 700,000 acres in 1928-29.

In the meantime the Serere Experiment station was being developed and work being done on the selection of suitable strains for the Eastern Province. The Nyasaland variety was worked on almost to the exclusion of other types. A selection, N. 32, made in the original plot of Nyasaland in 1915-16 was a promising strain and was worked up gradually until in 1921 it was planted in the Kadunguru gombolola and distributed throughout Teso and Lango in the following year. In 1919 a plot of N. 30, a brother of N. 32, was grown at Simsa and in this plot a selection, N. 17 was made. Three acres of N. 17 were grown in 1922 at Serere and this variety stood out as being resistant to a disease which was undoubtedly black-arm. N. 17 formed the main crop at Serere and Simsa in 1924-25 and in the following season it was grown in the Kadunguru gombolola, one

which is suited to segregation; from this stage it has gradually been increased until it has now been distributed over the whole Eastern Province. In most areas it has given better results than the pre-existing type which was mainly N. 32. A new strain, S.G. 29, also a selection from Nyasaland Upland, is now being used to replace N. 17.

TABLE I.

Showing the Increase in the Cotton Crop since 1906.

(The acreage figures are very inaccurate but they suffice to give some idea of the rapid spread of the crop):—

Year.	*Acreage.*	*Bales.*	*Calculated yield per acre.*	*No. of Ginneries.*
1906	—	500	—	—
1907	—	2,000	—	—
1908	—	4,000	—	—
1909	—	5,000	—	—
1910	—	12,000	—	—
1911	—	20,000	—	—
1912-13	50,000	26,000	690	—
1913-14	110,000	40,000	480	—
1914-15	118,000	26,000	290	—
1915-16	92,000	22,000	320	—
1916-17	129,000	28,000	290	—
1917-18	134,000	27,000	270	—
1918-19	145,000	36,000	330	42
1919-20	155,000	47,000	400	58
1920-21	207,600	81,000	520	—
1921-22	164,000	48,000	390	100
1922-23	345,000	88,000	340	101
1923-24	418,000	128,000	410	—
1924-25	572,000	196,000	460	147
1925-26	610,000	180,000	390	—
1926-27	590,000	131,000	290	176
1927-28	533,000	138,000	350	189
1928-29	698,000	204,000	390	192
1929-30	663,000	125,000	250	192
1930-31	724,000	Incomplete	—	—

TABLE II.

Summary of Main Events Connected with Cotton in Uganda.

1872.—Gallini cotton introduced by Samuel Baker into Bunyoro.
1903.—First Government importation of seed for trial; Uganda Company also imported seed.
1905.—Variety Black Rattler grown with considerable success.
1907.—Decision to proceed with American Upland types only.
1908.—Government took full control of importation and distribution of seed.
1911.—First proper seed station opened at Kadunguru. Sunflower obtained from East Africa.
1913-14.—Acreage over 100,000.
1915-16.—First importation of Nyasaland Upland.
1916-17.—First time whole Protectorate planted with a selection made locally.
1918-19.—Introduction of cotton tax.
1919-20.—Prices up to 59*d.* per lb. paid. Serere experiment station opened.
1920-21.—Drop in prices—Government purchased part of crop.
1925-26.—Strain N. 17 first put into general distribution.
1928-29.—Bales attained 200,000 mark.
1929-30.—Serious spread of Blackarm disease.

REFERENCES.

The following books have been referred to:—

"A Journey to the Source of the Nile," by Speke and Grant.
"The Rise of Our East African Empire," by Lugard.
"The Wild and Cultivated Cotton Plants of the World," by Watt.

APPENDIX No. 3

IMPERIAL INSTITUTE,
LONDON, S.W. 7.

REPORT ON TOBACCO FROM UGANDA.

The samples of tobacco which are the subject of this report were forwarded for examination to the Imperial Institute by the Director of Agriculture, and are referred to in his letter No. 641/736 dated the 1st April, 1930.

It was stated that the tobaccos had been grown at Bulindi, Bunyoro, Northern Province, from "White Burley" and "Amotilla" seed and that they had been air-cured.

DESCRIPTION.

(1) *Variety "White Burley"* (Weight 1¼lbs.)—Four hands of large leaves measuring from 22 by 12 inches to 29 by 16 inches. The leaves were of medium warm brown colour and of fair substance. The midribs and veins were normal and the butts well covered.

(2) *Variety "Amotilla"* (Weight ¾lb.).—Four hands of large leaves measuring from 21 by 9 inches to 28 by 12 inches. The leaves were of light warm brown colour, thin, weak, lacking in elasticity, inclined to be papery and rather gummy. The midribs and veins were normal and the butts generally well covered.

RESULTS OF EXAMINATION.

The tobaccos (lamina only) were chemically examined with the results shown in the following table, which are expressed on leaf containing 14 per cent of moisture :—

(1) *White Burley.*	*Per cent.*
Moisture	14·0
Nicotine	5·5
Nitrogen	3·9
Ash	15·2

The ash had the following composition :—

		Ash as prepared. Per cent.	*Calculated on CO_2—Free ash. Per cent.*
Lime	CaO	27·11	33·14
Magnesia	MgO	7·00	8·57
Potash	K_2O	25·07	30·64
Soda	Na_2O	0·31	0·38
Sulphates, expressed as sulphuric anhydride	SO_3	4·45	5·44
Chlorides, expressed as chlorine	CL	4·77	5·83
Carbonates, expressed as carbon dioxide	CO_2	18·20	—

(2) *Amotilla.*	*Per cent*
Moisture	14·0
Nicotine	4·2
Nitrogen	4·2
Ash	13·9

SMOKING TRIALS.

White Burley.—The leaf showed good combustion, leaving a grey ash. The flavour was strong, rather coarse, and lacking in Burley character.

Amotilla.—The leaf showed good combustion, leaving a white to grey ash. The flavour was of the cigar type but too coarse and strong for cigars intended for the United Kingdom market.

COMMERCIAL VALUE.

The tobaccos were submitted to merchants and brokers for commercial valuation.

The merchants reported as follows :—

"These tobaccos appear on test to burn well and we should say that they would be very useful for certain classes of wrapper work, such as brown roll, etc. For texture we consider that the Amotilla leaf is slightly the better quality of the two, being rather more of a silky nature, not too heavy, but strong and particularly desirable for the purpose

mentioned. Both types are inclined to be a little on the veiny side for the requirements of a first-class wrapper leaf, but this, no doubt, could be remedied in the production, and with this fault eliminated we should say that under present market conditions these tobaccos should realise round about 1s. 6d. per pound, usual London terms."

The brokers furnished the following opinion :—

"*White Burley.*—This has reasonable body, some leaves are on the thin side, but generally speaking it is a satisfactory Burley type for which the market has been paying from 1s. 5d. to 1s. 8d. We would point out, however, that it is a very limited market and the price realised for the tobacco depends entirely whether it is wrappery. If thin and papery, it becomes difficult of sale.

Amotilla.—This is a type which is distinctly thin and not one we would recommend. Only suitable for cutting tobacco, it would not be in great demand and we would not care to indicate a price higher than 1s. to 1s. 2d.

Both the above prices are based on what is being realised for Nyasaland Burley types, but we do not believe that Uganda tobacco would differ to any great extent.

In the production of Burley type, however, it must be recognised that India has made rapid strides. There are considerable shipments of Indian Burley leaf on this market, the majority, if not all, being somewhat shorter than the types you have sent to us. There is also a fairly large stock of Burley strip and when we say that Burley leaf is available from 7d. to 9d. and Burley strips at very little more, unless Uganda Burley is of really good quality, we cannot recommend production. Indian Burley is entirely a cutting tobacco and any African Burley of non-wrappery character falls in the same category."

It will be observed that the opinions of the merchants and brokers do not quite agree regarding the possible uses of these tobaccos and particularly with respect to the Amotilla leaf. It would seem, however, that the view of the brokers is the more correct, indicating that Amotilla leaf of the quality of the present sample would not be suitable for cigars.

REMARKS.

The sample of White Burley consisted of large leaves with a good spread and of good even colour and appearance. They possessed good combustion but the flavour was strong and rather coarse and lacking in Burley character. The results of the chemical examination showed that they contained a rather high percentage of nicotine. The composition of the ash was satisfactory.

The Amotilla leaf was of the cigar type but was rather too red and did not possess sufficient elasticity for use as a wrapper. It burned well but the flavour was rather strong and too coarse for use as fillers for the United Kingdom market. It could be used in pipe tobacco blends.

The composition of both samples of leaf shews a rather high percentage of nitrogen, to which the strong flavour is no doubt attributable.

From the analysis it would appear that the tobaccos have been grown on soil rather too rich in nitrogenous constituents.

22ND AUGUST, 1930.

APPENDIX 4

LEVER BROTHERS LIMITED,
(Temporary address during re-building): UNION HOUSE,
ST. MARTIN'S-LE-GRAND, LONDON, E.C. 1.
DECEMBER 10TH, 1930.

SHEA PRODUCE.

I have now received a report on the sample of shea nuts which you were good enough to have collected and forwarded to me as announced in your letter dated 15th September under reference No. 1689/345.

The sample of shea nuts was submitted to my colleague, Mr. Cecil Revis, who has a long experience in the commercial utilisation of shea butter. Mr. Revis reports on the nuts as follows:—

"We have made an examination of the oil extracted from the above kernels in the laboratory and have found the following figures:—

Fat	52·35%
Moisture	5·65%
Saponification value	185·70
Iodine value	66·10
Unsaponifiable matter	6·00%
Free fatty acids	1·73%

These kernels were the best that have ever come under my observation. They were uniform and clean, free from breakage and evidently, from the colour of the meat, freshly gathered. The original creamy colour was quite distinct in the great majority of the kernels examined, the change to the usual "cocoa" colour being only partial and evidently beginning from the interior outwards. The extracted oil was also of excellent colour. As with all these Uganda kernels, the unsaponifiable matter appears to be somewhat deficient in quantity, though whether the fat from such kernels will still make a satisfactory bakery fat could only be determined after working these kernels on a large scale.

C. REVIS."

Nigerian shea nuts, which constitute at present practically the whole of the available commercial supplies, are worth £11 10s. per ton in Europe at the present time. The market for these kernels is a rather specialised one so that the prices have not undergone such violent fluctuation in the last two years as have the prices of other African oil seeds, such as groundnuts and palm kernels.

If it were possible to secure regular supplies of kernels of the quality of the sample, analysis of which is given above, the value delivered Antwerp, for example, would be at present probably £12 per ton. The maximum price which shea kernels have ever reached is, I believe, £15 per ton, but this figure was an uneconomic one, so I am informed. At a price of £12 per ton I imagine this would permit a payment of £4 to £5 per ton at the producing centres, corresponding to $3\frac{1}{2}$ to $4\frac{1}{2}$ cents per lb. This is about the price paid for shea kernels in the Benue region of Nigeria, where, however, the length of transport to the coast is less than in Uganda and is by water instead of rail.

Quantities of kernels permitting shipments of 100 tons at a time might become interesting to Lever Bros.' associates at the delivered price quoted above.

Through the courtesy of Mr. Ireland of your department, I was able to secure a sample of native butter from the district of Lira, and on analysis the following figures have been obtained:—

Saponification value	186·1
Iodine value	65·7
Free fatty acid	5·3%
Unsaponifiable matter	5·4%

You will note that in the case of the butter also the unsaponifiable matter is somewhat on the low side, commercial samples of West African butter showing 6—8% of unsaponifiable matter.

Some similar figures are given by some samples of shea produce derived from the districts of Kajo Kaji and Moru of Mongalla Province, Sudan. I was able to obtain samples for analysis through the courtesy of the Imperial Institute and the following figures will be of interest to you for comparison :—

SHEA KERNELS—SUDAN :	
Fat	53·50%
Moisture	4·10%
Saponification value	184·60
Iodine value	62·10
Unsaponifiable matter	3·70%
Free fatty acids	8·50%
SHEA BUTTER—SUDAN :	
Saponification value	184·7
Iodine value	61·8
Unsaponifiable matter	4·3%
Free fatty acids	6·5%

It is interesting to note that the Sudan has independently carried out enquiry as to the possibilities of this shea trade; and it might be helpful for the Uganda Protectorate to consider the possibility of evacuating some, at least, of its shea produce *via* the Nile to Port Sudan. I have no available transport rates which would allow me to express an opinion on this point, although naturally the Uganda Protectorate would wish to support its system of evacuation, namely, the K.U.R.

The present position, therefore, as I see it, is that Shea produce which can be obtained in Uganda Protectorate and in the Sudan would be very suitable for the preparation of cooking fats in Europe, but before one can go any further it is very necessary to have some idea of the quantities which would be available.

In studying the matter also you would wish to note that freshly, well-prepared kernels are preferable to the native-made butters, and this is true not only from the point of view of the quality of the butter but also in relation to the yields of butter and the economy of native labour.

I cannot insist too much, however, on the real necessity for careful preparation of the kernels for export, and particularly for attention to two points: (1) The collection of ripe kernels, and (2) the proper drying of the kernels before packing for export.

APPENDIX No. 5

IMPERIAL INSTITUTE,
SOUTH KENSINGTON,
LONDON, S.W. 7,
22ND JULY, 1930.

SIR,

With further reference to your letter No. 1014/350 of the 26th May last forwarding fourteen Monitor lizard skins for valuation, I have to inform you that representative specimens have been submitted to a firm of brokers in London who are represented on the Imperial Institute Advisory Committee on Hides and Skins. The following report has now been received from the firm :—

"We have examined the samples you forwarded and find these to be fairly well marked, cut up back, fleshy, dirty, blood-bound and over-dried (apparently in the sun). We regret these skins are useless for tanning purposes.

The following instructions should be of assistance to the Director of Agriculture :—

Skinning and cleaning should be effected at the time of killing. All flesh and blood should be carefully removed; the skins should be cut up the belly (in the middle), carefully staked out (but not stretched in the width), and dried in the *shade*. If possible the lizards should be caught with a trap or a hook. If they are killed with a fork, it is necessary to prick them on the head, as a hole in the middle of a skin reduces its value. The minimum width of skins required is 8 inches.

The value, of course, depends upon the preparation, quality and size of the skins. This description would be readily saleable, and we would recommend a shipment of, say, 50 skins, correctly prepared as above, which we would submit to the buyers.

We shall be very pleased to furnish any further information."

In view of this report it is suggested that a small shipment of 50 skins might be prepared in the manner described, and forwarded to the Imperial Institute for trial sale through the firm

I am, Sir,
Your obedient servant,
HAROLD BROWN, *Principal*,
Plant and Animal Products Department.

Native Agriculture—Estimate of Approximate Acreages of Crops under Cultivation, 1930.

Province and District.	Plantains.	Potatoes.		Millets.		Cotton.	Coffee.		Para Rubber.	Simsim.	Ground Nuts.	Chillies.	Maize.	Rice.	Wheat.	Beans.	Peas.	Tobacco.	Sugar Cane.	Cassava.	Miscellaneous Crops.
		Sweet.	English.	Mtama.	Wimbi.		Robusta.	Arabica.													
	ACRES.																				
Buganda:—																					
Mengo	300,000	60,000	600	3,000	12,000	99,506	2,500	163	100	7,000	11,000	70	50,900	200	...	30,000	700	...	1,300	50,000	500
Entebbe	68,367	20,050	918	1,659	...	41,023	4,207	300	28	1,240	3,620	142	10,265	18	...	9,916	346	200	1,163	13,520	...
Masaka	62,000	5,100	51	3,100	500	25,600	4,400	2,400	50	155	3,700	50	2,500	...	...	2,010	500	36	...	2,600	...
Mubende	33,000	45,000	300	2,802	15,000	28,500	2,000	200	250	4,815	6,000	40	17,300	5	30	5,600	100	700	500	38,000	...
Total ...	463,367	130,150	1,869	10,561	27,500	194,629	13,107	3,063	428	13,210	24,320	302	80,065	223	30	47,526	1,646	936	3,163	104,120	500
Eastern Province:—																					
Busoga	160,882	30,000	115	10,000	55,079	132,890	7	8	...	3,526	5,915	181	10,601	500	...	18,863	...	20	500	5,000	143
Budama	19,500	4,176	...	4,424	21,267	31,816	...	...	...	2,123	1,282	2	2,353	1,430	...	6,300	...	10	50	7,855	...
Bugwere	31,480	12,712	...	8,699	79,698	107,484	...	...	...	15,527	7,535	..	5,668	2,895	...	12,000	...	...	139	3,748	...
Bugishu	52,550	11,886	1,106	1,895	21,184	26,793	...	1,962	...	520	1,444	22	6,036	2,429	...	7,766	...	5	193	5,403	...
Teso	2,760	44,202	...	23,391	101,290	118,813	...	...	...	8,857	30,939	24	1,219	1,264	...	27,284	60	1	20	11,639	106
Lango	512	42,399	...	43,671	99,261	66,757	...	24	...	48,126	17,897	63	4,920	...	...	7,702	49,311	5	2	21,761	...
Karamoja	...	400	...	13,000	1,000	...	...	...	...	400	500	...	10	...	...	100	...	500	...	10	...
Total ...	267,684	145,775	1,221	105,080	378,779	484,553	7	1,994	...	79,079	65,512	292	30,807	8,518	...	80,015	49,371	541	904	55,416	249
Northern Province:—																					
Bunyoro	8,000	14,000	50	2,000	15,000	15,000	100	210	...	12,000	1,200	...	1,000	...	...	10,000	700	440 (a)	50	1,000	500
Gulu	14	7,150	2	9,100	19,000	19,915	...	...	...	18,100	2,850	...	200	30	...	2,900	...	3	...	7,100	...
Chua	...	4,000	...	...	90,000	12,000	...	...	...	60,000	600	...	150	4	...	40	...	...	...	600	...
West Nile	100	33,800	20	72,600	80,500	6,580	2	220	...	45,800	1,100	...	210	200	...	26,000	12,200	...	100	2,800	100
Total ...	8,114	58,950	72	83,700	204,500	53,495	102	430	...	135,900	5,750	...	1,560	234	...	38,940	12,900	443	150	11,500	600
Western Province:—																					
Toro	55,000	16,028	120	4,000	5,100	6,000	2,600	85	...	50	590	2	1,100	45	165	2,000	10	10	120	4,240	5
Ankole	31,000	16,200	60	7,248	32,000	1,013	...	1,000	...	5	322	10	4,143	...	2	18,600	2,660	303	3	263	100
Kigezi	8,000	30,000	60	25,000	25,000	...	...	100	...	50	50	...	25,000	..	15	22,000	25,000	...	10	100	...
Total ...	94,000	62,228	240	36,248	62,100	7,013	2,600	1,185	...	105	962	12	30,243	45	182	42,600	27,670	313	133	4,603	105
Grand Total ...	833,165	397,103	3,402	235,589	672,879	739,690 (b)	15,816	6,672	428	228,294	96,544	606	142,675	9,020	212	209,081	91,587	2,233	4,350	175,639	1,454

(a) 290 acres fire-cured. All other tobacco acreages cured by native methods.

(b) In Eastern Province, with the exception of Lango District, estimates of the acreages planted were based on sample plot measurements in 1930, and approximately 30,000 acres of the increase of 1930 figures above those of 1929 is due to the new computation basis.

Total 3,866,439 Acres.

APPENDIX No. 7

Livestock—1930.

Province and District.	Cattle.	Sheep.	Goats.	Horses.	Mules.	Donkeys.	Pigs.
BUGANDA :—							
Mengo	62,096	32,411	194,211	3	...	13	...
Entebbe	23,711	8,180	54,770	...	...	4	73
Masaka	92,204	9,300	45,581	...	...	1	35
Mubende	26,995	10,162	37,470	...	...	2	...
TOTAL ...	205,006	60,053	332,032	3	...	20	108
EASTERN :—							
Busoga	99,434	42,453	247,304	...	...	...	...
Budama	80,182	19,974	52,266	...	...	...	...
Bugwere	75,256	17,535	111,110	...	...	...	...
Bugishu	153,326	52,722	148,137	...	30	...	3
Teso	291,487	44,470	103,163	...	60	...	...
Lango	251,991	73,740	125,000	...	...	2	...
Karamoja	150,000	160,000	85,000	...	3	15,000	...
TOTAL ...	1,101,676	410,894	871,980	...	93	15,002	3
NORTHERN :—							
Bunyoro	5,000	12,000	48,000	...	2	1	...
Gulu	38,604	13,294	36,771	...	1	6	...
Chua	26,500	21,400	29,300	...	1	10	...
West Nile	115,869	42,278	141,233	...	6	8	20
TOTAL ...	185,973	88,972	255,304	...	10	25	20
WESTERN :—							
Toro	77,600	34,000	73,100	...	...	15	22
Ankole	194,448	98,420	155,405	1	1	5	4
Kigezi	220,000	100,000	140,000	...	...	2	50
TOTAL ...	492,048	232,420	368,505	1	1	22	76
GRAND TOTAL ...	1,984,703	792,339	1,827,821	4	104	15,069	207

APPENDIX No. 8

European Agriculture, 1930.

COMPILED FROM RETURNS FROM 217 PLANTATIONS.

Province and District.	Number of Estates.	Total Acreage taken up.	Total Acreage cultivated.	Coffee.		Para Rubber, Acres.	Tea, Acres.	Cotton, Acres.	Tobacco, Acres.	Maize, Acres.	Miscellaneous. Acres.
				Arabica, Acres.	Robusta, Acres.						
BUGANDA :—											
Mengo ...	72	34,282	11,694	2,696	3,462	7,020	...	120	91	50	8
Entebbe ...	18	6,793	2,328	479	546	1,388	100	...	5	...	...
Mubende ...	14	8,384	1,890	1,250	120	474	247	...	...	...	...
Masaka ...	19	6,738	1,525	898	469	350	...	...	...	...	...
TOTAL ...	123	56,197	17,437	5,323	4,597	9,232	347	120	96	50	8
EASTERN :—											
Busoga ...	8	9,187	866	610	200	50	...	...	...	40	126
WESTERN :—											
Toro ...	65	26,143	4,618	4,509	61	...	13	6	...	66	24
NORTHERN :—											
Bunyoro ...	21	12,678	3,429	2,042	599	1,106	...	...	7	17	35
GRAND TOTAL	217	104,205	26,350	12,484	5,457	10,388	360	126	103	173	193

2,934 acres are interplanted with various crops.
Returns were not received from 54 estates, and figures from previous returns have been included in the above in respect of the permanent crops.

APPENDIX No. 9

Asiatic Agriculture, 1930.

COMPILED FROM RETURNS FROM 35 PLANTATIONS.

Province and District.	Number of Estates.	Total Acreage taken up.	Total Acreage cultivated.	Coffee.		Para Rubber, Acres.	Sugar Cane, Acres.	Cotton, Acres.	Sisal, Acres.	Miscellaneous, Acres.
				Arabica, Acres.	Robusta, Acres.					
BUGANDA—										
Mengo ...	12	14,485	5,940	573	82	600	5,225	...	...	...
Entebbe ...	6	1,904	213	88	...	75	50	...	...	...
Mubende ...	3	1,525	220	200	...	10	...	...	...	10
Masaka ...	4	2,402	525	5	75	320	125	...	...	...
TOTAL ...	25	20,316	6,898	866	157	1,005	5,400	...	...	10
WESTERN—										
Toro ...	2	585	74	74	...	...	...	...	...	...
NORTHERN—										
Bunyoro ...	2	10,100	1,205	...	...	...	...	...	1,200	5
EASTERN—										
Busoga ...	6	10,458	2,770	25	65	800	1,880	...	...	...
GRAND TOTAL ...	35	41,459	10,947	965	222	1,805	7,280	...	1,200	15

540 acres are interplanted with various crops.

Returns were not received from 11 estates, and figures from previous returns have been included in the above in respect of the permanent crops.

APPENDIX No. 10

Comparative Statement of Uganda Produce Exported

FROM MOMBASA FOR THE YEAR ENDED 31ST DECEMBER, 1930.

ARTICLES.	Unit.	From 1st January to 31st December, 1930.		From 1st January to 31st December, 1929.		INCREASE.		DECREASE.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Raw	*centals*	516,489	1,555,344	816,228	3,312,667	...	...	299,739	1,757,323
,, Seed	*tons*	33,578	137,387	67,523	424,000	...	...	33,945	286,613
Coffee, Hulled	*cwts.*	46,131	148,577	34,626	155 298	11,505	...	...	6,721
,, Parchment	,,	1,872	5,110	5,996	20,552	...	...	4,124	15,442
,, Unhulled	,,	853	1,308	570	1,286	283	22	...	...
,, Prepared	,,	2	16	½	6	1½	10	...	...
Rubber, Plantation	*centals*	6,270	16,814	8,231	28,818	...	...	1,961	12,004
Tobacco, Unmanufactured ...	*lbs.*	123,659	5,544	61,967	3,040	61,692	2,504	...	...
,, Cigarettes	,,	20,707	5,405	114	26	20,593	5,379	...	...
Chillies	*cwts.*	3,078	7,573	6,174	26,133	...	...	3,096	18,560
Jaggery, Unrefined Sugar ...	,,	195	168	97	103	98	65	...	...
Sugar, Refined	,,	6,670	8,718	4,276	7,071	2,394	1,647	...	...
Ground Nuts	*tons*	1,289	15,123	316	5,419	973	9,704	...	...
Cacao, Raw	*cwts.*	...	...	4	12	...	...	4	12
Simsim, Seed	*tons*	1,416	17,964	1,338	24,890	78	...	...	6,926
,, Oil	*Imp. gls.*	2,522	467	1,678	464	844	3	...	...
Ghee (Clarified Butter) ..	*cwts.*	11	53	62	475	...	...	51	422
Oil Seed Cake	*tons*	205	1,180	74	495	131	685	...	...
Skins, Sheep and Goats ...	*No.*	205,200	7,670	258,045	12,901	...	...	52,845	5,231
,, Miscellaneous	,,	5	11	78	49	...	...	73	38
Hides, Dry and Dry Salted ...	*cwts.*	21,492	49,518	35,099	152,542	...	...	13,607	103,024
Ivory	,,	302	13,632	407	24,757	...	...	105	11,125
Hippo Teeth	,,	11	48	2¾	17	8¼	31	...	...
Horns	*lbs.*	25	1,620	231	639	...	981	206	...
Tin Ore	*tons*	351	55,300	324½	63,900	26½	...	...	8,600
Tin, Manufactured, unenumerated ...	*value*	...	4	...	...	...	4	...	...
Other Ores	*tons*	...	...	4¾	271	...	...	4¾	271
Methylated Spirits	*Imp. gls.*	1,212	218	1,418	287	...	...	206	69
Rectified Spirits	,,	42	10	174	39	...	...	132	29
Timber	*cub. ft.*	2,501	603	3,533	1,161	...	...	1,032	558
Maize	*cwts.*	560	127	9,925	3,882	...	...	9,365	3,755
Maize Meal and Flour	,,	1,541	659	888	468	653	191	...	...
Tea	,,	10	85	12½	133	...	...	2½	48
Goods, manufactured, unenumerated	*value*	...	727	...	957	...	...	...	230
,, unmanufactured, unenumerated	,,	...	74	...	781	...	...	...	707
Miscellaneous Exports	,,	...	3,397	...	1,216	...	2,181	...	...
TOTAL ...	£	...	2,060,454	...	4,274,755	...	23,407	...	2,237,708

Net decrease :—£2,214,301.

Comparative Statement of Exports from the Uganda Protectorate.

ARTICLES.	Unit.	Year ended 31st December, 1926.		Year ended 31st December, 1927.		Year ended 31st December, 1928.		Year ended 31st December, 1929.		Year ended 31st December, 1930.	
		Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£
Cotton, Raw	Centals	723,438	3,051,791	526,911	1,690,838	553,944	2,475,327	816,228	3,312,667	516,489	1,555,344
,, Seed	Tons	35,360	194,887	29,500	170,303	45,506	323,110	67,523	424,000	33,578	137,387
Coffee, Raw	Cwts.	33,211	147,884	43,514	170,407	40,355	164,187	...	...	...	...
,, Hulled	,,	...	...	...	...	...	...	34,626	155,298	46,131	148,577
,, Parchment	,,	...	...	...	...	...	...	5,996	20,552	1,872	5,110
,, Unhulled	,,	...	...	...	...	...	...	570	1,286	853	1,308
,, Prepared	,,	...	...	...	...	...	...	½	6	2	16
Rubber, Plantation	Centals	13,561	135,619	14,463	82,077	11,312	54,978	8,231	28,818	6,270	16,314
,, Wild	,,	...	...	33	84	...	...	...	...	...	...
Tobacco, Unmanufactured	lbs.	...	...	...	...	8,539	327	61,967	3,040	123,659	5,544
,, Cigarettes	,,	...	...	...	...	...	...	114	26	20,707	5,405
Chillies	Cwts.	1,245	1,715	1,308	4,359	4,437	25,848	6,174	26,133	3,078	7,573
Jaggery (Unrefined Sugar)	,,	272	215	436	425	125	130	97	103	195	168
Sugar, Refined	,,	1,255	1,599	10,161	16,371	2,749	4,434	4,276	7,071	6,670	8,718
Groundnuts	Tons	389	6,026	2	40	150	2,636	316	5,419	1,289	15,123
Cacao, Raw	Cwts.	10	18	64	160	2	6	4	12	...	...
Simsim Seed	Tons	194	4,130	718	13,732	115	2,162	1,338	24,890	1,416	17,964
,, Oil	Imp. Gals.	...	...	88	25	1,536	422	1,678	464	2,522	467
Ghee (Clarified Butter)	Cwts.	...	...	...	...	31	239	62	475	11	53
Oil Seed Cake	Tons	...	...	...	...	136	847	74	495	205	1,180
Skins, Sheep and Goat	No.	88,750	5,173	78,411	4,091	163,042	8,039	258,045	12,901	205,200	7,670
,, Miscellaneous	,,	...	...	...	...	202	14	78	49	5	11
Hides, Dry and Dry Salted	Cwts.	7,640	27,357	29,619	99,541	58,677	257,288	35,099	152,542	21,492	49,518
Ivory	,,	202	18,289	499	34,574	329	21,759	407	24,757	302	13,632
Hippo Teeth	,,	10	86	2	15	1	4	2¾	17	11	48
Horns	lbs.	448	346	448	453	336	722	231	639	25	1,620
Metalliferous Ores, non-ferrous	Tons	...	...	117½	20,875	252	50,673	...	...	...	...
Tin Ore	,,	...	...	...	...	...	...	324½	63,900	351	55,300
,, Manufactured, unenumerated	Value	...	...	...	...	...	...	...	...	...	4
Other Ores	Tons	...	...	...	...	...	...	4¾	271	...	...
Methylated Spirits	Imp. Gals.	...	...	638	96	543	94	1,418	287	1,212	218
Rectified Spirit	,, ,,	...	...	...	...	...	...	174	39	42	10
Timber	Cub. ft.	5,144	1,703	4,637	917	2,283	609	3,533	1,161	2,501	603
Maize	Cwts.	...	...	...	...	...	...	9,925	3,882	560	127
Maize Meal	,,	...	...	...	...	...	...	888	468	1,541	659
Tea	,,	...	...	...	...	...	...	12½	133	10	85
Goods, manufactured, unenumerated	Value	...	177	...	162	...	309	...	957	...	727
,, unmanufactured	,,	...	82	...	62	...	293	...	781	...	74
Miscellaneous Exports	,,	...	340	...	653	...	810	...	1,216	...	3,397
TOTALS	...	...	3,597,437	...	2,310,260	...	3,395,267	...	4,274,755	...	2,059,954

Details of Machinery at Ginneries in the Uganda Protectorate—1930 Season.

Province and District.	Ginneries.		Gins.				Seed Openers.		Presses.				Engines.					
			Roller.		Saw.				Hand.		Power.		Steam.		Oil.		Suction Gas.	
	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.	Working.	Silent.
Eastern :—																		
Busoga	19	17	328 *a*	112	1	21	19	12	4	15	15	1	15	11	6	5	...	...
Budama	6	1	49 *a*	...	15	5	4	...	3	3	5	...	2	...	3	1	1	...
Bugwere	10	3 *b*	119	8	11	12	9	1	2	9	8	...	6	...	2	2	2	1
Bugishu	2	2	21	24	...	2	2	2	...	1	2	1	2	1	...	...	...	1
Teso	11	14	145 *a*	136	6	9	11	13	...	11	11	6	6	5	1	2	4	7
Lango	9	8	126 *a*	57	4	8	10	6	1	7	9	2	8	5	2	2	1	2
Total ...	57	45	788 *a*	337	37	57	55	34	10	46	50	10	39	22	14	12	8	11
Buganda :—																		
Mengo	31	14	456	139	2	2	32	14	6	8	26	6	22	10	6	2	7	2
Entebbe	9	2	161	18	3	...	9	2	1	1	8	1	9	2	2	...	...	...
Masaka	8	2	129	10	...	2	9	1	1	1	7	...	8	2	1	...	...	...
Mubende	8	4	90 *a*	30	...	3	8	3	4	4	4	...	8	3	...	1	...	...
Total ...	56	22	836	197	5	7	58	20	12	14	45	7	47	17	9	3	7	2
Northern :—																		
Bunyoro	3	2	32	10	2	2	3	1	1	1	2	1	3	1	...	1	...	...
Gulu	3	1	33	10	...	...	3	1	1	..	2	1	3	1	...	...	...	...
Chua	1	...	12	...	...	...	1	...	...	...	1	...	1	...	...	...	...	...
West Nile	1	...	...	...	3	...	...	...	...	...	1	...	1	...	...	...	...	...
Total ...	8	3	77	20	5	2	7	2	2	1	6	2	8	2	...	1	...	...
Western :—																		
Toro	1	...	6	...	...	...	1	...	1	...	...	...	1	...	...	...	...	...
Ankole	...	1	...	...	...	1	...	...	...	...	...	...	...	1	...	..	...	...
Total ...	1	1	6	...	...	1	1	...	1	...	...	...	1	1	...	...	...	...
Grand Total	122	71	1,707	554	47	67	121	56	25	61	101	19	95	42	23	16	15	13
	193		2,261		114		177		86		120		137		39		28	

a Includes Double Roller Gins : Mubende 3, Busoga 4, Budama 4, Teso 12, Lango 20, Total 43. *b* Includes one licensed but silent.

List of Circulars obtainable from the Director of Agriculture, Entebbe:—

No.

2. COTTON CULTIVATION.
3. DISEASES OF *HEVEA BRASILIENSIS* IN UGANDA.
4. DIEBACK OF *COFFEA ARABICA* IN UGANDA.
7. REPORT ON COFFEE CULTIVATION IN UGANDA.
8. DISEASES OF CEREALS IN UGANDA.
9. DISEASES OF *COFFEA ARABICA* IN UGANDA.
13. COFFEE BUG (*ANTESTIA LINEATICOLLIS* STAL., VAR).
14. *COFFEA ROBUSTA* IN UGANDA.
15. CULTIVATION AND PREPARATION OF *COFFEA ROBUSTA*.
16. COTTON EXPERIMENTS 1925—1926.
17. (A) THE OCCURRENCE OF ANGULAR LEAF-SPOT OF COTTON IN UGANDA.

    (B) ROT OF *HEVEA CORTEX* IN UGANDA.
18. RUBBER EXPERIMENTS ON THE GOVERNMENT PLANTATION, KAMPALA.
19. SUGAR CANE IN UGANDA.
20. NOTES ON THE CULTIVATION, CURING AND PACKING OF FIRE-CURED TOBACCO.
21. SOIL MANAGEMENT AND MANURING.
22. VARIEGATED COFFEE BUG (*ANTESTIA* SPP.).